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THE TWENTY-SEVENTH MAUDSLEY LECTURE : THE UNWILLING PATIENT.

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IN England the welfare of the patient who is compelled to submit himself to treatment on account of a mental malady has now for one and three-quarter centuries been a matter of concern to doctors and some others—with the intermittent assistance of the public conscience as represented by our legislature. Madness was never respectable, and it is still apt to be regarded as an infliction from without rather than as a very ordinary illness from which mankind, in common with other animals, is prone to suffer. The popular notion that a person once attacked by insanity is rendered as a matter of course violent and dangerous still survives. Such ignorance was universal in the Middle Ages, and it was felt to justify consistent and rigorous confinement away from other human beings. Some of the ancients maintained the existence of spirits of different qualities, and held that an intercourse existed between the material and spiritual worlds. It was believed that in some instances the mind was merely deranged by a malignant influence of a demon. In others, when a change of characteristics was more evident and more complete, it was thought that there was an actual exchange of soul. The insane person was either consulted as an oracle or shunned as possessed of an evil spirit. These ideas gave way in the Greek and Roman period to equally strange theories of the physical origin of mental disease, but the unusual and bizarre quality of the illness continued throughout the ages to justify the belief that some outer or other world influence was at work. Thus the patient became in turn the victim of religious ceremonies intended to cure him and of confinement and neglect. These theories of demon possession which determined the mode of treatment were in no way inconsistent with the essential love of mankind for man.

Rosalind in "As You Like It" (Act III, Scene 2) is made to say: "Love is merely a madness and deserves as well a dark house and a whip as madmen do." The dark house and the whip indicate two methods to be used in the care and treatment of mental illness—confinement and coercion, a combination of isolation in darkness and punishment. Although the most famous physician of the eighteenth century, Pinel, denied the advantages of restraint in treatment of insanity, he wrote thus on the art of counteracting human passions and diseases by the use of force: "The doctrine in ethics of balancing the passions of men by others of equal or superior force is not less applicable to the practice of medicine than to the science of politics, and is probably not the only part of resemblance between the art of government of mankind and that of healing their diseases." In his *Treatise on Insanity* (1806) he relates the treatment of a French nobleman (shortly after the French Revolution) who suffered from melancholia and who recovered under treatment by the "bath of surprise." During the process of bathing in cold water (his hands and feet were tied) the patient's fury was greatly increased by the mortifying consideration that owing to the Revolution his rank was neglected and ignored. Notwithstanding the violence with which he resisted the treatment it was practised on him for some time. The patient recovered, and as continued treatment during

convalescence he was induced to take a warm bath as a preventative. Thus was the nobleman brought at last to accept the bath as an unpleasant but necessary implement of cure. Pinel, however, deplors the use of unnecessary force, and describes his ideal psychiatrist as "one who conceals with great address the means of constraint to which he is compelled to resort, yields to their caprices with apparent acquiescence, eludes with dexterity their inconsiderate demands, soothes with coolness and kindness their intemperate passions, turns to advantage every interval of their fury, and meets with force their otherwise incoercible extravagances."

When I read through the accounts of treatment given to patients as late as the middle of the nineteenth century by honest and earnest physicians I marvel at the toughness of the patient, and wonder what has become of all the stalwart men and women who treated life as a contest to enjoy and did not trouble too much about a little physical pain or discomfort. The same attitude is well illustrated by Francis Galton, who in his *Art of Travel* (1872) wrote regarding the use of lucifer matches, "in a steady downpour of rain you may light a match for a pipe under a horse's belly," and again in illness, "for want of proper physic drink a charge of gunpowder in a tumbler of water or soapsuds and tickle the throat."

Nevertheless, for the unwilling victim of mental illness there was no easy way out, and the patient who had been dealt with as a dangerous lunatic was treated with great severity. Dr. Crowther in 1838 used an apt quotation: "there is nothing so easy as entrance, nothing so tardy as deliverance."

As to the incidence of mental disorder, there appears to be no reliable estimate made during the nineteenth century. After 1840 or so figures of those confined were available, but this was not the whole story. In Cheyne's *English Malady* (1737) I read that "nerves, distempers, spleens, vapours and lowness of spirit are in derision (by all our neighbours on the Continent), and called the English Malady. Thus nervous disorders are computed to make almost one-third of the Complaints of the People of Condition in England." After an interval of 200 years we find Russell Fraser making a similar estimate!

I will not weary you with an account of the medicinal treatment of insanity through the ages. Suffice it to say that the patients suffered much. My main purpose is to give you some details of the way in which the unwilling patient has been handled during the past 150 years, and to show how treatment was often interpreted in terms of management. In the nineteenth century many learned and honest physicians had no great faith in any form of treatment. Cure was a natural phenomenon which they could not control. For them there was—

"The toil
Of dropping buckets into empty wells,
And growing old in drawing nothing up."

During the years that restraint and seclusion were giving place to "moral treatment" the patient was still forced into a mental subordination as an essential prerequisite to recovery. I quote Pinel's account of Dr. Willis, a famous English physician of the late eighteenth century: "Of the celebrated Willis it has been said, that the utmost sweetness and affability is the usual expression of his countenance. But, when he looks a maniac in the face for the first time he appears instantly to change character. His features present a new aspect such as commands the respect and attention even of lunatics. His looks appear to penetrate into their hearts, and feel their thoughts as soon as they are formed. Thus it is he obtained an authority over his patients, which afterwards co-operating with other means, contributed to restore them to themselves and their friends."

I propose now to consider some developments in psychiatry in this country as they appear in the enactments relating to lunacy, and through the eyes of the Commissioners in Lunacy, of whom Lord Shaftesbury was chairman for forty years (1845-85). It is a wide field, and I have therefore found it wise to limit myself to the treatment of the unwilling patient, with special reference to restraint, seclusion and detention, adding asides on matters which may be of interest to you in the light of our practice at the present time.

In the eighteenth century the state of the insane poor in England can be inferred from the dreadful circumstances of private patients who were confined in hospitals and licensed houses, and whose condition became from time to time the subject of public comment and parliamentary investigation. So little indeed was the

question understood that the first Act which notices the pauper lunatics (1744) enabled any two justices to cause him to be apprehended and be "locked up" in some secure place and "there chained." Mechanical restraint by chains, cuffs and bars was continued well into the nineteenth century. In December, 1842, the Commissioners reported that at Wreckenton Asylum, near Gateshead, chains were attached to the floor in several places, and it was the practice to chain patients by the leg, upon their first admission, in order, as it was said, to see what they would do. Iron frames were used at Kingsdown House, which did not allow the freedom of hand locks. A patient was chained by her legs to a wooden seat in a paved passage to prevent her, as it was stated, hurting herself in her fits. In the same period restraint was used by means of jackets, dresses, gloves, belts and other similar contrivances which limited the patients' movement or activity. At St. Peter's Hospital, Bristol, in addition to the jacket and leg locks, an open mesh of leather passing round the face and also around the forehead to the back of the head was at one time used for such patients as were in the habit of biting. In 1843 it was noted that the biters' mask had not been used for some time.

The Commissioners in Lunacy in an attempt to reduce the amount of restraint proposed separate rooms for the temporary seclusion, during short periods only, of those who suffered the paroxysms of excitement or violence (padded rooms were already in use). On the other hand they gave details of cases to show the danger of the total disuse of mechanical restraint in the management of patients. In 1844 they sought the views of medical superintendents throughout the country on the subject of restraint. Opinion appeared generally to be against it, though some few regarded it as a necessary evil; it was sometimes valuable as a precaution and beneficial as a remedial agent. Three doctors considered it less irritating than holding with the hands, and one of them preferred it to seclusion. Those who favoured restraint held that it was necessary to acquire as soon as possible a certain degree of authority and influence over the patient, and to enforce obedience to such salutary regulations as might be laid down for his benefit.

Support for those who were against any form of restraint came from Lincoln Lunatic Asylum (now known as The Lawn), opened in 1828. It is here that the practical abolition of mechanical restraint as a method of treatment was first advocated and carried into effect by Dr. Charlesworth (with whom, in 1835, was associated the house-surgeon, Dr. Gardner-Hill). They succeeded to such an extent that the percentage of cases so treated was reduced from 54 in 1829 to 1.5 in 1837. The principle of non-restraint, with which Dr. Connolly was also identified from his appointment as Medical Superintendent of Hanwell in 1839, was discussed at length in the final report of the Metropolitan Commissioners in 1844, in which opinions on each side of the question will be found fully set forth. But the adoption of non-restraint brought its own problems, and in 1846 and 1847 there was a lively correspondence between the Commissioners and the Governors of Lincoln Asylum. The former complained that there were no rooms in which excited patients could be isolated; that there was no adequate segregation of the sexes; inadequate classification had led to the mixing of quiet and excited patients, with the result that during the course of the previous year almost every injury had resulted by blows given in exchange between patients. They commented, too, on the indiscriminate admission of strangers to the hospital, attention to whom appears to have taken up much of the time of the house-surgeon. There were three visiting physicians, one of whom, Dr. Charlesworth, was also a Governor. A bitter feud seemed to have existed between him and another of the visiting physicians, Dr. Nicholson, who protested against the abandonment of restraint with the consequent indiscriminate mixing of patients. There was, as well, a difference of opinion on the issue of porter to certain patients. But Dr. Charlesworth, with the assistance of the three lay Governors, had his way and restraint was no longer used.

In 1847 the Commissioners were requested by the Secretary of State for the Home Department to prepare a code of Asylum Rules for the whole country. After submitting them to some experienced medical officers of asylums they were put up for approval. The main objects in framing Rules were set out under three headings, the third of which sought to effect the separation of the sexes; a proper classification of the patients to ensure to them the means and opportunities of exercise, employment and amusements; to provide them with a sufficiency of attendants; to prevent their suffering from harshness and unnecessary restraint; to give facili-

ties to the visits of their friends, and in every respect to ensure as far as may be their health, tranquillity and general comfort. In the same year (1847) they write that personal restraint is diminishing, and even where it is still employed its severity is greatly diminished. It is evident that restraint was coming to be regarded not as a satisfactory method of treatment but merely as an economic necessity. Licensed houses promised that their private patients would not be restrained and, in fact, one licensed house in an advertisement declared that restraint was not and never would be used. The Commissioners, ever on the alert, discovered that in this same place restraint was in fact constantly used but was not recorded or reported.

In 1850 at Fisherton House, Salisbury, the Commissioners heard of a practice which was incautiously referred to as "day sheets." Thinking that this was a new form of restraint analogous to the wet and dry pack they inquired into the practice, and found that it was the habit to place clean sheets on certain beds during the day and to remove them at night. They felt it their duty to remonstrate strongly with Dr. Finch, the proprietor, against a practice which had the effect of deceiving the Commissioners, Justices, and other Visitors to the establishment, by giving a fictitious appearance of comfort to the patients' beds. In the following year the Commissioners were able to report that the practice of using day sheets had been entirely discontinued; and that at Camberwell House also day sheets were no longer permitted to be used.

The steady improvement in the quality and the number of attendants on the insane led the Commissioners to say in 1852 and again in 1860 that there was a great improvement in that there was diminished use of restraint as a form of treatment. In 1873 there was noted a general consensus of opinion against coercion, but the abolition of restraint by consent rather than by legislation was favoured. There was, however, one outstanding exception. At a visit by Commissioners to Colney Hatch in 1873 the amount of restraint was remarked upon as being without precedent in any English asylum, and the hope was expressed that some less objectionable mode of dealing with violent and destructive propensities would be adopted. The Committee of Visitors replied: "Setting aside the mere question of expense, manifestly unjustifiable, it is impossible to conceive a more galling and irritating kind of restraint than the ceaseless surveillance of a bad attendant of uncertain temper. A false estimate of the uncomfortableness of "gloves" and other mechanical restraints is frequently formed by assuming that the condition of the sane (who judge) is identical to that of the insane (who are judged). As a rule, with but few exceptions, the enjoyment of the latter is not in any way lessened by a process which would be as disagreeable and degrading to the former as the habits for which it is the obvious corrective." The Visitors added that they agreed with Dr. Sheppard that when it became the choice between some slight restraint and continuous struggling with an attendant, both the safety and comfort of the patient were promoted by the adoption of the former alternative. A long correspondence followed, and I believe had some effect in reducing the use of restraint.

In 1889 and 1890 the Commissioners were still bothered about the continued use of restraint in a few hospitals. They referred particularly to the use of mechanical restraint in the treatment of patients in Bethlem. They disapproved of any form of mechanical restraint used with a view to economy of attendants or simply to prevent destruction of dress or bedding, and they advocated frequent intermission of restraint where it must be employed. Under Section 40 of the Lunacy Act, 1890, new regulations governing restraint were issued; those regulations are well known to you all.

During the period 1840-1845 the use of restraint had greatly diminished and in consequence a new problem arose. Buildings did not lend themselves to the grouping of patients according to type and behaviour. Consequently seclusion came to be regarded by some as the only alternative to restraint in the management of troublesome patients.

It is probable also that the use of seclusion of the insane patient was based not only on the necessity for putting aside dangerous patients, but because it was thought that the "dark house" might have some beneficial effect on the disease. The need for seclusion seems to have been broadly accepted, but from time to time there appeared in the reports of committees and in writings on psychiatric subjects suggestions that the use of isolation had been abused to an extent which, even in the early nineteenth century, none could suffer to continue. The subject was dis-

cussed by the Metropolitan Commissioners in 1844. In order to reduce the necessity for bodily coercion they had pressed, in the Metropolitan district, the division of patients into classes, the separation of those who were excited or dangerous or with offensive habits from those who were quiet and agreeable. They further recommended the erection of separate rooms for the temporary seclusion, within short periods only, of those who were subject to paroxysms of excitement or violence. Finally, recommending seclusion as a proper treatment, they went on to illustrate by examples the dangers attending the total disuse of mechanical restraint.

The legislature at this time required a register of restraint to be kept but not yet of seclusion. At Hanwell Asylum, however, they had already adopted a method of recording seclusion, and the requirement was printed in the rules of the asylum. The rules contained elaborate details relating to the care of patients, and, in particular, their occupation during the day. Notwithstanding these signs of progress there is in 1858 a reference to the widespread use of seclusion in the workhouses of the country; the "dark strong cells constructed for the solitary confinement of refractory paupers are used for the punishment of the insane, merely to prevent trouble, and even the dead house has been made to serve the purpose of a seclusion room!" Seclusion used in this way was described as merely another method of restraint employed usually at the discretion of nurses or attendants, and without the knowledge of the Medical Officer or of the Master of the workhouse. The public asylums were, on the whole, better conducted, though in 1859 the amount of seclusion used at the West Riding Asylum was noted and suggestions made for its diminution. The Commissioners were better pleased in 1860: they commented on the steps that were being taken to reduce the amount of seclusion, which was formerly frequent and prolonged.

Seclusion was defined as any amount of compulsory isolation in the day-time whereby a patient is confined in a room and separated from all associates. The definition gave seclusion a wider interpretation than some would have liked, but attention being called to it there resulted a gradual discontinuance of the practice, leading to a more satisfactory condition of the patients. Notwithstanding the Commissioners' efforts the practice of locking up patients alone was still carried on in a few asylums, not always it was alleged for medical reasons but often as a matter of convenience and perhaps of economy. Many medical men, however, regarded seclusion as a most valuable agent in the treatment of insanity and there was a general desire that it should be permitted, but a record should be kept to prevent its being adopted for other than medical reasons. Such views were expressed in 1858, notwithstanding that under Section 59 of the Act of 1845 the law required a record of seclusion to be kept in all institutions where it was used. Apparently the requirement had been ignored.

On 20 May, 1866, an anonymous letter was received by the Board of Commissioners and in consequence of it a special visit was paid to Colney Hatch Asylum. They found that destructive patients were secluded in a room by day and by night without bedding of any kind with only bare boards and brick walls and entirely naked. One had been thus shut in for as long as 10 nights and one for several weeks. It appears that such a system was quite unknown in the other asylums in this country. Dr. Sheppard, the physician to the hospital, not only admitted the charge as substantially true, but informed them that a similar treatment had been adopted in a series of cases where patients were destructive of clothing and bedding. He defended the practice on the grounds that the skins of these patients were of such an unnaturally high temperature that they were quite insensible to cold; that all covering was painful and irksome to them, and that their own choice was to remain naked. The doctor was so sure of his ground that he wrote in some of the leading medical journals vindicating a form of treatment which the Commissioners had condemned. After much correspondence he agreed to the request of his Committee of Visitors not to repeat the practice he had justified. In 1873 it is recorded that in Durham, Stafford, Brentwood and Brookwood Asylums seclusion was no longer employed, and in thirteen other asylums it was very rarely used. The Commissioners expressed the now general opinion by questioning the utility of seclusion on the ground that its remedial value was much exaggerated, and that in many instances it was employed unnecessarily and to an injurious extent for periods which were quite unjustifiable. They had no doubt that the patients were often put in seclusion as a punishment, and that the effect it produced could be obtained by treatment of

a less repressive character. From this time on seclusion was used less frequently, and only by the direction of a medical officer. At Hoxton House in 1899 a nurse was dismissed for secluding a patient without medical order, and ignoring the rules of the establishment that the patient's clothes should be removed and the patient visited at intervals of 15 minutes. This attitude reflects the position as it exists to-day. Better nursing with good classification of patients have made the use of seclusion unnecessary. Seclusion is rarely used, and except in an emergency it is not generally thought to have any advantages as a means of treatment.

Turning now to the question of detention under care it is important to distinguish between the private patient and the person who was a charge on the parish. The 1774 Act referred only to private patients. Paupers were not included, but were sent to asylums without any medical certificate and without any authority except that of their parish officers. Up to the year 1808 the only enactments affecting pauper lunatics were certain provisions in the Vagrant Acts authorizing the detention of dangerous lunatics. By the 1828 Act no pauper patient could be received without a medical certificate. Under Section 67 of the Act of 1853 the relieving officer or overseer of the parish brought him before a justice, or if this were inconvenient, before an officiating clergyman. One medical certificate was also required. Under certain circumstances (not properly taken care of or cruelly treated) two justices were required in place of one.

The power to place private patients in a house set apart for the treatment of persons of unsound mind, always subject to certain limitations, remained with the relatives or friends. The manner of admitting patients on the ground of lunacy in the eighteenth century appears to have been subject to the whim or greed of the person keeping the house and, indeed, it would appear that any patient could be put away by a relative who seemed to the proprietor of the house to have some semblance of authority. Giving evidence before a Committee of Inquiry in 1773, Dr. Battie gave it as his opinion that private mad-houses required some better regulation; that the admission of persons brought as lunatics is too loose and too much at large, dependent upon persons who are not competent judges. On being asked if he had ever met a person of sound mind in confinement for lunacy, he said it frequently happened. He related the case of a woman perfectly in her senses brought as a lunatic by her husband to a house under the doctor's direction, whose husband, upon Dr. Battie insisting that he should take his wife home, justified his action by frankly saying that he thought the house was a sort of Bridewell or House of Correction. A Mrs. Horley, having been invited in an affectionate letter by her mother and husband to go on a party of pleasure to Turnham Green, was carried by them to a mad-house at Chelsea kept by Turlington. She alleged that she was shut up night and day in a chamber locked and barricaded, refused the use of pen and paper and treated with severity. She was never visited by her mother and remained in confinement until, following action by some friends, she was granted by Lord Mansfield a writ of habeas corpus and so achieved discharge.

The report on the investigations of the Select Committee of the House of Commons, 1773, led to the passing of the Act of 1774. Thereafter houses were licensed, and the President and members of the College of Physicians for the time being elected annually five Fellows as Commissioners for granting such licences. The Commissioners so appointed were to visit the houses they licensed at least once a year to examine their state and the condition of the inmates. This applied only to the Metropolitan area, i.e., the Cities of London and Westminster and within seven miles thereof and within the County of Middlesex. Corresponding duties for the provincial areas were to be carried out by Justices of the Peace appointed at Quarter Sessions. Another Parliamentary Committee of Inquiry which sat in 1815 and 1816 carried out a most rigid inquiry into the condition of the insane. The result of that investigation fully satisfied every person of importance that immediate legislative interference was necessary. Nevertheless, matters were allowed to remain in this state until 1828, when Mr. R. Gordon submitted a motion to the House for leave to bring a Bill to amend the law relating to the regulation of lunatic asylums. This Bill became the Act of 1828. Some of the provisions may be of general interest. The Act provided that no person, other than a parish patient, should be received into any house kept for the reception of two or more insane patients without a certificate. Every such certificate was to be signed by two medical practitioners who had separately visited the patient. The physician was merely

called upon to certify to the abstract fact of the presence of unsoundness of mind in any given case. It was not until 1853 that he was required to state the facts upon which his opinion was founded.

In order further to protect the interests of the patient, the Secretary of State of the Home Department was directed to appoint on 1 June every year, or within ten days following, not less than fifteen persons to be Commissioners for the Metropolis, of which Commissioners, five at least had to be physicians, or surgeons. They were to be allowed £1 for every hour employed in visitation, exclusive of travelling expenses, provided that the number of Commissioners did not exceed three for one visitation. The Justices sitting at Quarter Sessions were to appoint three or more of their number and also one or more physician or apothecary to perform the corresponding duties outside the London area.

While important progress was made as a result of legislation in 1828, it is quite clear that patients were received sometimes on inadequate grounds and sometimes illegally. As late as 1843 a lady found confined in a licensed house at Derby was represented as a visitor and not a patient. She was later proved to have been brought from another asylum where she was a certified patient. The proprietor had, for financial reasons, given a certificate of detention so that the trustees could pay to her husband dividends to which she was entitled. She was liberated after the Commissioners had protested that her detention was improper.

The Act of 1828 provided also that every licensed house containing 100 patients should have a resident physician, surgeon or apothecary. Pressure was put on the County Asylums authorities also to observe this sensible provision. At the Norfolk County Asylum in August, 1843, there being no resident doctor the lay superintendent was asked what he would do in cases requiring immediate attention and treatment. His answer was that he would not venture upon the responsibility of applying remedies, that he could not bleed and had no knowledge or experience, medical or surgical. Upon being asked again what steps he would take in such cases he said that he would send to Norwich, the nearest place three miles distant, for one of the medical Visitors. He subsequently directed the Commissioners' attention to a pony on the lawn which, he said, was constantly ready to be saddled as occasion required.

In 1842 the Metropolitan Commissioners were given authority to visit places for the insane in the whole of England and Wales. Some of their reports showed that all was not well. The high incidence of bad practice observed made it clear that the visits of the magistrates had not had the effect of correcting all the irregularities and abuses existing at many establishments, nor of putting an end in a few instances to cruelty of the most flagrant character. In referring to the work of the Visitors, they suggested that subjects of inquiry to which hitherto full attention had not been given were the state of mind of the patient in reference to his fitness for liberation, the nature and effect of the employment provided for the patients with a view to diverting their disease, the character of the medical reports as indicative of the care and intelligence bestowed on the mental condition of the patients by medical officers, and the rate of payment made for the patients and the attention bestowed upon them by their parish officers.

After their first visit to The Retreat, near York, the Commissioners paid a tribute to Mr. Samuel Tuke. They complimented him as "a gentleman well acquainted with the management of the principal lunatic asylums, and who has, for many years, made the treatment of lunacy the subject of his especial observation; and he called our attention to the necessity of the more frequent and vigorous supervision of all asylums. As he has already expressed his sentiments on this subject, in a publication relating to hospitals for the insane, we have thought it right to lay them before your Lordship." The visit to the asylum at West Auckland in December, 1842, did not end so happily. Although there were only thirteen males and sixteen female patients, the space available out of doors was so small that when one sex was in it the other was locked up. In the men's room, with only one (unglazed) window, five men (of thirteen) were restrained by leglocks called hobbles, and two were wearing, in addition, iron handcuffs and fetters from ankle to wrist. They were all tranquil! The Commissioners who first visited the asylum wrote that, in their opinion, the place was entirely unfit for the reception of insane persons. On the day following their visit two local magistrates made this minute in the Visitors' Book: "We have to-day visited the asylum and found the Commissioners had just left it. We found

everything in good order." At the second visit in 1843 only one patient was under restraint. On this occasion they learned that the medical attendant considered that bleedings, blisters and setons were the principal resources of medicine for relieving excitement.

During the years following the Acts of 1842 and 1845 the question of the liberation of patients by their friends or by parish officers was frequently raised and great irregularity in practice was alleged. The Commissioners referred to the many occasions when liberation was obtained by the importunities of the patient or took place in order to save the expense of his confinement in a lunatic asylum. They were, however, mainly concerned with the dangers attending the release of dangerous lunatics. It was not proposed at any time to limit the powers of the friends of the private patient, but rather to give to some persons full authority to bar the discharge of dangerous patients with, at the same time, power to insist on the discharge of those who need no longer be detained.

Section 99 of the 1845 Act enumerates those who are to be protected at law from the consequences of their action in contributing to the certificates and detaining the patients, i.e., the medical man, the keeper of the asylum and servants, but leaves out the person authorizing the detention. Such person was only protected at common law if the patient confined was, in fact, a lunatic. *The Times* of June, 1849, gives an account of an action for damages for the incarceration of the plaintiff, a maiden lady, in a licensed house for lunatics, under the pretence that she was of unsound mind when, in fact, she was perfectly sane. Miss Nottidge, with two married sisters, joined a religious society, the members of which lived together in an establishment called *The Abode of Love*. She was forcibly taken away by the defendants, her brother-in-law and brother, was brought to London and was placed in a licensed house at Hillingdon, where she was detained for seventeen months, and then liberated by the direction of the Commissioners in Lunacy. There was a verdict for the plaintiff with damages of £50. The Jury expressed the view that the defendants were not actuated by any unworthy motive. During the course of this trial, and in particular during a conversation between the Lord Chief Baron of the Exchequer (the Presiding Judge) and Mr. Milne, one of the Commissioners, his Lordship was understood to express an opinion that no person ought to be confined as a lunatic unless he was dangerous to himself or others. It was pointed out by the Commissioner that this opinion was not consistent with the wording of the Lunacy Acts. Now everybody was alarmed, and his Lordship's opinion led to discharge by the relatives of a large number of patients who, by common consent, should have been under care. The Annual Report of the Royal Edinburgh Asylum shows how fearful friends of lunatics had become: "there seemed to be a general apprehension that all lunatics who were not actually and immediately dangerous to themselves or others were forthwith to be set at large to vex the World with their Follies and to expose themselves to Insult, Imposition and Injury. The influence of the Decision referred to seems to have so far affected the better judgment and experience of some Parties, that not a few Removals from asylums were the Consequence; for during the past year not less than four patients were admitted into this asylum who had been dismissed from Confinement (I should rather say deprived of protection) under this Nottidge mania, and had subsequently been breaking windows, knocking down Policemen, carrying loaded Pistols on their Persons to shoot Doctors with, or wandering through the streets under the belief that they were royal or divine personages." Here then was an occasion when the rightness of an Order to detain a person who was harmless was questioned by a noble judge with much effect on the people who assumed responsibility for the detention of patients in licensed houses and registered hospitals.

The following case illustrates another point of view: In 1862 a Member of the House of Commons who was under care in a licensed house was given leave of absence to record his vote on a matter before the House. From the certificate it appears that the gentleman was subject to delusions impelling him to violence rendering him dangerous to others. On the morning of the Division the Medical Superintendent with the patient went to consult the proprietor (himself a medical man) on the propriety or otherwise of permitting the patient to take part in the vote that evening. He was warned of the consequences, but the medical superintendent, on his own responsibility, gave the patient leave from 8 p.m. to 2 a.m. When the matter came to the ears of the Commissioners there was an inquiry, the

medical officer was found guilty of a grave breach of professional trust and was required to resign his post.

The problems relating to the detention of patients who are not immediately dangerous have, on several occasions throughout the century, been considered by the House of Commons through Select Committees. There has appeared from time to time an expression of feeling that many patients are unnecessarily detained, and that there should be some stricter form for securing the detention of patients, and closer supervision to ensure that no patient is retained under Order for a moment longer than the social necessities demand. Medical requirements were apparently not given much attention, largely because there was a suspicion that a patient unless he were dangerous could be treated as well out of hospital as under the strict régime of an establishment for lunatics. In the Parliamentary Session of 1877 a Select Committee of the House of Commons was appointed "to inquire into the operation of the Lunacy Laws so far as regards the Security afforded by it against violation of personal liberty." The Committee reported in March, 1878.

As to the liberty of the subject, they considered that although the present system of certification was not free from risk, allegations of *mala fides* or of serious abuses were not substantiated. Nevertheless with the object of correcting abuses, they made certain suggestions. The Commissioners were unhappy about these recommendations. They were not disposed to advocate any radical changes in existing law, and were satisfied that the present system of certification, both of private and pauper lunatics, provided adequate safeguards. They were satisfied, too, that the visitation of places where patients were received afforded in practice ample safeguards as well against the admission of persons not of unsound mind as for the discharge of the insane patients without undue detention. But they thought some improvement could be made by modifying existing regulations. As the law stood the request in private cases might be signed by anyone who chose to take the responsibility and who had seen the patient within a month. He must state his relationship, and if no relation, his other circumstances in connection with the patient. It sometimes happened, though not frequently, that in the urgency of the case no relative could be found, so that the request might be signed by a friend or other acquaintance, or occasionally even by a servant. Great exception had lately been taken to this and they thought that it should where possible be avoided. At the same time they were unable to recall any instance in which they had occasion to question the good faith of Orders so made.

The new proposal, based on the Select Committee's Report, which was made, in a private Bill in 1880, providing that no person should be sent to an asylum except upon an Order granted by a Justice of the Peace of the district, was strongly opposed by the Commissioners on the ground that the certain result of the measure would be to increase in many cases the reluctance, already very great, to place a relation under early treatment. The Bill sought also to provide that the petition must be signed by a relative or by a solicitor on his or her behalf duly authorized, or a relieving officer, accompanied by certificates signed by two registered practitioners, one of which must be the Medical Visitor of the district. The Commissioners wrote that "the proposal seemed to them to depend on constantly reiterated assertions that further safeguards are needed for the liberty of persons alleged to be insane. The existence of such a feeling is doubtless to be regretted, but it would be entirely contrary to sound principle to alter the law in an important particular without evidence of recent abuse." The Bill did not pass the House.

Notwithstanding the Commissioners' reservations in 1880 the Act of 1890 included a provision that except in cases of urgency no private patient should be received except on an Order. The Act introduced for the first time a public functionary termed the "Judicial Authority" as the authority for the reception and detention of the private patient. For pauper patients a justice or an officiating clergyman had long been required to sign the "order." The Commissioners were strongly opposed to these new provisions. They gave their own views and called to their aid those of the late and deceased Chairman, Lord Shaftesbury, as to the expediency of the change. A similar recommendation had been made by the Select Committee of 1878 when the Commissioners had opposed it. They now expressed the hope that the change involving the more complicated and difficult procedure for obtaining Orders might not lead to the results they feared, namely, the placing of an impediment in the way of *early treatment*, so important in the care of

insanity, and to the withdrawal from official cognizance and supervision of many insane persons.

Another innovation was introduced during this period. Hitherto certificates had remained in force so long as the patient was detained, but by the Lunacy Amendment Act of 1889 the authority for the detention of all patients, pauper as well as private, was made terminable at various periods during the detention unless renewed by a prescribed process.

The provisions relating to voluntary patients, as they are known to-day, were born in 1854 through an Amending Act which, amongst other things, empowered proprietors and superintendents of licensed houses, with the consent of the two Commissioners, to entertain and keep as a boarder any patient desiring to remain *after his discharge*, and any relative or friend of a patient. There was, however, a severe limitation. The Commissioners were not to consent until they had, by personal examination of the patient, satisfied themselves of his desire to remain. Any two Commissioners, might from time to time, by any writing under their hands extend or revoke any such assent. The tight hand was seen in the further provision in Section 6 of the Act that every such patient so retained after discharge and every such relative or friend so accommodated shall, if required, be produced to the Commissioners and Visitors. Apparently the experiment succeeded, because the Lunacy Acts Amendment Act, 1862, extended the provision to any person who may have been within five years preceding a patient in any asylum, hospital or licensed house or under care as a single patient.

As there was no provision in the Lunacy Acts expressly prohibiting or regulating the reception of boarders into hospitals or such provision being confined exclusively to licensed houses, it was hoped that the voluntary boarders' provision might be extended to the hospitals called "registered hospitals." With this in view the Commissioners sought Counsel's opinion whether, in the circumstances, persons ("being conscious of want of power, of self-control or an addiction to intemperate habits, or fearing an attack or recurrence of a mental malady"), being free agents in all respects, are desirous of residing as voluntary boarders in an institution for the insane with a view to medical treatment and supervision may be admitted to Registered Hospitals. Counsel agreed and thereafter voluntary boarders were admitted to registered hospitals.

The Select Committee of the House in 1878 made suggestions as to the removal of restrictions on voluntary boarders. The Commissioners protested that the existing system of admitting boarders had answered quite well. They were prepared to extend it to any person who at any time had been an inmate of an institution for the insane or had been a single patient, but they did not recommend the indiscriminate admission of persons never certified as insane. Their objections were based on the fear of attempts at evasion of the law by introducing as boarders persons who ought to be under certificate, by the fear of the introduction of mere drunkards, and by the fear of crowding the houses to the inconvenience of insane persons. They insisted that the prior consent of themselves or the Visitors should be required. Even in the Act of 1890 the admission of voluntary boarders was confined to Licensed Houses and only by implication to Registered Hospitals, though the conditions relating to reception were slightly modified; the consent of the Commissioners or Justices was still required. Provision for any relative or friend of the patient was continued. Thus the facilities relating to voluntary boarders were extended very, very slowly, and we had to wait until 1930 before voluntary patients could be admitted to hospital without the consent of the central department.

I have endeavoured to trace the development in this country of certain aspects of illness, and to show how society dealt with some of the problems which are always associated with a mental breakdown. It has not been possible to do more than indicate briefly the direction in which we are moving. It is, however, clear that we need new laws and new provision for the mentally ill. These I have no doubt will come in due course. Your support and your enthusiasm will ensure that when it comes it will be in a form which will enable medical and social treatment to be carried out under the conditions you desire.

In concluding this lecture I would like very briefly to express my own views on two points of major importance to psychiatry. The first relates to the certification of patients as persons of unsound mind. In the period immediately prior to 1890 there was a strong feeling expressed by a Select Committee of the House of Commons

that the intervention of some legal authority was necessary before a private patient could be committed to a hospital for treatment. I have been unable to ascertain the exact reasons for the proposal, except only that it had for a long time been required for the detention of pauper patients. In spite, however, of the Commissioner's protests, a new provision with this requirement was included in the Act of 1890. That may have been a step backwards. Since 1930 we have experimented with a system of temporary detention made on the recommendation of two doctors, but it applied only to patients who were unable to express themselves as willing or unwilling to receive treatment. Consequently it could not be widely used. It is possible that if such a provision were extended to cases where the patient is unwilling because he is mentally ill, we should often avoid using the greatly feared process of certification.

My second point relates to the voluntary patient. The Mental Treatment Act, 1930, provided for the first time for the voluntary admission of a patient seeking treatment though he has to give three days' notice of departure. This was a long step forward, but the proportion of voluntary patients admitted varies so widely—between 45 and 94 per cent.—that it is evident that in some hospitals the provision is not being fully used. Nevertheless the experience since 1930 has been so encouraging that many of us would like to go further and admit suitable patients into mental hospitals under the same informal conditions that govern admission to hospitals for the treatment of physical disease. I believe with Galton that "treatment is a chain of eventualities each of which must be a success." The doctor's relationship with the patient depends on confidence, and it would be a further great advance if conditions of any kind were imposed only where it is shown to be absolutely necessary. Society is ready to use new paths in psychiatry; it is hoped that psychiatrists will show the way.

THE MODE OF ACTION OF ELECTRO-CONVULSIVE THERAPY.

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How electro-convulsive therapy (E.C.T.) acts, what is the chain of cause and effect from the electrical application to the clinical improvement, are questions whose answers are as uncertain as ever, in spite of the importance of such knowledge to psychiatry and in spite of the researches of nearly twenty years. The experiments reported in this paper are an attempt to elucidate the links of one possible chain. What are the possibilities? I shall review them briefly, restricting the review to the physiological and biochemical aspects and omitting any reference to the psychological or psycho-analytical.

The review is made difficult, and the analysis of the experimental evidence complicated, by the fact that the variables are inter-related in a complex pattern. They form a dynamic whole such that a disturbance at any point causes changes sooner or later at almost all other points. The chief variables and their main direct effects are shown in Fig. 1, which, though showing only the essentials, shows clearly the complexity of the interactions. I shall consider the variables at first in pairs.

The evidence that E.C.T. affects the hypothalamus is mostly indirect, though the uniformity with which the hypothalamus reacts to almost every form of stress leaves little doubt that E.C.T. will act similarly (Cheng *et al.*, 1949; Farrell and McCann, 1952; Fortier, 1951; Long and Fry, 1945; Selye, 1946, 1952). The electric current is certainly likely to excite the hypothalamus directly, for both Lorimer *et al.* (1949) and Hayes (1950) have shown that much of the current passes through the basal structures, where it would stimulate the hypothalamus both directly and through the stimulation of such structures as the medial forebrain bundle, the thalamo-hypothalamic fibres (with their relay at the periventricular nuclei), the fornix, the *stria terminalis*, and the pallido-hypothalamic fibres, structures whose stimulation would necessarily lead to stimulation of the hypothalamus. There is no doubt that an electrically-induced convulsion ("E.I.C." to distinguish it from the therapy) can affect the structures of the diencephalon, for Wikler and Frank (1948) have shown, in the decorticated cat, that E.I.C. abolishes the diencephalic reflexes of righting, licking and sham rage. Roth (1952), too, has found evidence that E.C.T. has an effect on the hypothalamus.

Evidence that E.I.C. affects the pituitary has been obtained mostly by observing the effects on the pituitary's targets, for direct evidence of the pituitary's reaction is hardly to be obtained. There is little doubt that the pituitary can be affected directly in its posterior part, for Altschule *et al.* (1948) showed how E.C.T. evokes several signs of its activity, and Harris (1948) confirmed the action in the rabbit. He also showed, with Markee (1946), that prolonged electrical stimulation to the rabbit's hypothalamus induced ovulation, whereas direct stimulation of the pituitary failed to induce it—clear evidence that so far as the secretion of luteinizing hormone is concerned, the hypothalamus has no nerve-endings in the pituitary but must act in some other way. Whether this other way could be a hormone of the type considered by the Scharrrers (1937) is still unknown.

The relation between E.C.T. and the secretion of adrenal steroids (Fig. 1) is both simpler and clearer, for the secretion of these substances can be observed almost directly. Thus E.C.T. was found by Ashby (1949) to cause a brisk outpouring of steroids in the first few days of treatment; and this was confirmed in another study (Ashby, 1952a) of a periodic catatonic who was treated with E.C.T. at intervals over five months. Other workers' studies have relied on less direct evidence of adrenocortical activity. Thus Hoagland *et al.* (1950) used a variety of indirect

tests when they showed that E.C.T., even when given in subconvulsive doses, caused an adrenocortical activity distinctly larger than that evoked by 25 mgm. of A.C.T.H. (Armour La-1-A). Similarly the numbers of circulating eosinophiles and lymphocytes have been used to show, by their fall after E.C.T., that adrenal steroids have been secreted (Altschule, *et al.*, 1949a, b; Mikkelsen and Hutchens, 1948).

The effect of E.C.T. on the cerebral metabolism (Fig. 1) is probably complex, for a variety of modes may combine to give the final pattern. Klein and Olsen (1947) have demonstrated some of the effects, showing that the amounts of glucose, glycogen, phosphocreatine, and ATP are decreased after electrical stimulation and after the giving of convulsant drugs; while lactic acid, ADP and inorganic phosphate are increased. Their results have been confirmed and extended by Dawson and Richter (1950), who used liquid air to ensure almost instantaneous immobilization of the metabolites, so that the biochemical changes could be followed from within a second or two of the giving of the shock. That the events in the first few seconds may be important is also suggested by the work of McIlwain *et al.* (1951), who showed that when the rat brain was stimulated *in vivo* there occurs, in the first few seconds, an increase in O_2 -respiration, in glucose utilization and in lactic acid formation much greater than occurs when similar stimulation is given to slices *in vitro*.

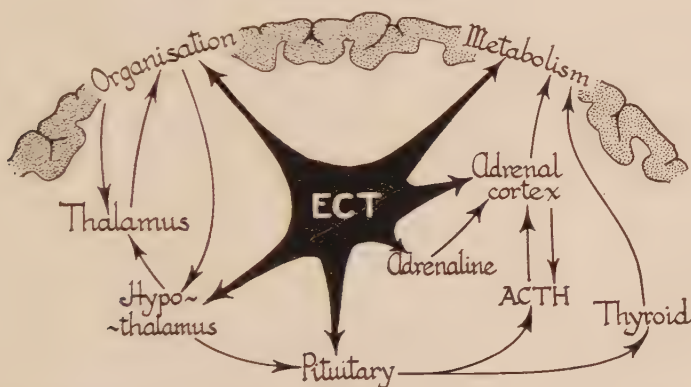


FIG. 1.—The most important variables affected by E.C.T., and their main direct effects, each of which is represented by an arrow.

Another route by which E.C.T. may affect the cerebral metabolism is by way of its effect on the organism's sensitivity to adrenaline and insulin. Gellhorn and Safford (1948), for instance, found that after E.I.C. rats became more sensitive to adrenaline, and this increase was confirmed by Funkenstein *et al.* (1948) in persons both normal and psychotic. Prokop (1947), however, obtained the contrary result, and Ashby (1952a), in a prolonged study of a patient who was already markedly insensitive to adrenaline, found E.C.T. to have little effect on the insensitivity. In this connection it should be appreciated that the system of Fig. 1 has several inter-lacing feedbacks and is therefore reactive, responding to any action of environment or experimenter with opposition. Thus, while the secretion of adrenal steroids is largely determined by the amount of A.C.T.H. in the blood, and partly by the amount of adrenaline (Recant *et al.*, 1950; Farrell and McCann, 1952), the release of A.C.T.H. from the pituitary is itself controlled, to some degree, by the amount of circulating steroid (Sayers and Sayers, 1947). Similarly the giving of E.C.T. has sometimes made patients less sensitive to A.C.T.H. (Altschule *et al.*, 1950), though those who were more sensitive showed a better therapeutic response to E.C.T. (Hoagland *et al.*, 1950). There is, therefore, some evidence that E.C.T. acts on the pituitary, causing it, perhaps among other actions, to secrete A.C.T.H. The next question is whether such a secretion might be responsible for the therapeutic effects. Various studies have been made, such as that of Clow and Prout (1946), on the psychiatric effects of such accidents and illnesses as are likely to evoke a secretion of A.C.T.H.; but more direct evidence has become available since the hormone was

isolated. When A.C.T.H. was given to normal subjects (Mason *et al.*, 1948; Thorn *et al.*, 1948), in doses sufficient to cause well-marked physical changes, the mental changes have been slight or absent, the only sign shown by Mason's subject, for instance, being that he became "listless and apathetic." When patients with physical illnesses (often rheumatoid arthritis) were treated with A.C.T.H., a wide variety of psychic reactions were observed, with euphoria as perhaps the commonest response (Sprague, 1951). Other workers, however, have rightly emphasized the stimulating effect of the suggestion that a crippling illness was to be ended, and have considered that the responses were simply manifestations of the patients' previous personalities (Brody, 1952; Rome and Braceland, 1950).

When A.C.T.H. was given to psychotic patients as treatment for their psychoses the results have been, in general, disappointing. Altschule and his colleagues (1949a, 1950) have reported three cases, all melancholics, who received A.C.T.H. in large doses without improvement, and who then received E.C.T. and recovered. Cleghorn *et al.* (1950) and Smith (1950) both tried it in mania and in melancholia; their patients showed either no improvement or one that was doubtful and transitory. Nor does the schizophrenic respond more favourably: it seemed for a time as if the treatment proposed by Lewin and Wassen (1949) offered prospects of success, but Rees and King (1951), in a carefully controlled study, found no evidence that it gave any benefit. This treatment used D.O.C.A.: even when the more physiological A.C.T.H. was used the results were no better, for the responses found by Glaser and Hoch (1951) and by Hoagland *et al.* (1950) were, so far as the psychological symptoms were concerned, few and slight. Cortisone proved equally inefficient (Cohn *et al.*, 1951; Rees and King, 1952).

When we turn to the action of E.C.T. on the cerebral cortex, we find the facts to be suggestive but not yet fully understood. If E.C.T. acts on the pituitary and adrenal it is likely to affect the cerebral metabolism, for pituitary extracts and adrenal steroids are known to have many effects on enzymes, such as hexokinase (Colowick *et al.*, 1947; Stadie *et al.*, 1950), phosphatase (Kochakian and Vail, 1944), cholinesterase (Hawkins and Nishikawara, 1949; Torda and Wolff, 1952), arginase (Folley and Greenbaum, 1946), cytochromes (Tipton, 1944), and lipoids (Campbell and Lucas, 1951)—all powerful factors in the cerebral metabolism.

One factor remains to be discussed. There is a possibility that E.C.T. may have a direct effect on the cortical machinery, not in its biochemical but in its cybernetic components, in its organization. Modern physiology regards the cerebral cortex as functioning not as a simple machine of a few determinate parts, but as a very great network in whose properties the statistical element must inevitably be prominent. Lashley (1952), for instance, uses the following words:

"Even the simplest bit of behavior requires the integrated action of millions of neurons; . . . I have come to believe that almost every nerve cell in the cerebral cortex may be excited in every activity. . . . Differential behavior is determined by the combinations of cells acting together rather than by cells which participate only in particular bits of behavior. The same neurons which maintain the memory traces and participate in the revival of a memory are also involved, in different combinations, in thousands of other memories and acts."

The study of such statistical systems of neurons has only just commenced, but already some facts are known. It has been shown (Ashby, 1952b) that one fundamental property that such systems will tend to show is that their responses, other things being equal, will tend to diminish. When the stimulus is repeated monotonously, the phenomenon is well known under the name of "habituation." We can also recognize, in everyday experience, a tendency for what is at first interesting and evocative to become later boring and uninspiring. Whether the extreme unresponsiveness of melancholia is really an exaggeration of this process is unknown, but the possibility deserves consideration. What makes the possibility specially interesting is that the theory of such statistical systems makes it quite clear that any complex network that has progressed to a non-responding state can, in general, be made responsive again by administering to it any large and random disturbance. The theory also makes clear that such a disturbance will necessarily disturb severely the system's memory: the parallel with E.C.T.'s effect on memory is obvious. Whether, however, E.C.T. acts in essentially this way is a question for the future.

These are the main relations between the variables shown in Fig. 1. In this paper are reported some experiments designed to explore in more detail the actions—

E.C.T.—→adenohypophysis—→adrenal cortex.

EXPERIMENTS.

In these experiments we used the rat (Wistar strain, closely inbred) and attempted to investigate the extent to which the adenohypophyseal-adrenocortical system was activated by E.I.C. For this purpose we needed an indication of the amount of A.C.T.H. secreted. Direct assay of its amount in the blood was, at the time of these experiments, not possible, though the work of Farrell and McCann (1952) has recently suggested that such an assay may be possible eventually. Practically our choice was restricted to estimating, in the adrenals of the rat that had received the E.I.C., the falls of either the ascorbic acid or of the cholesterol (Sayers and Sayers, 1947). For several reasons, including the fact that the rat can synthesize ascorbic acid without difficulty (Najjar and Barrett, 1945), we preferred to assay the cholesterol. After some preliminary studies the following method was selected.

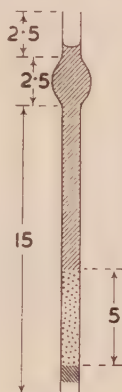


FIG. 2.

For the administration of the E.I.C., the ears were well cleaned with spirit, wetted with saline, and held by "crocodile" clips with flattened surfaces. (The ears were used in preference to flat electrodes on the head, for the ears force the current to enter the head at a place that is invariant anatomically.) Sinusoidal current at 50 c.p.s. was applied usually at 100 V.; its duration was controlled by a mechanical switch with a range from 0.1 to 1.0 seconds. (As will be shown in Experiment 5, these conditions, either of voltage or of timing, do not seem to be critical; neither does that of the site of the electrodes, for Lorimer *et al.* (1949) and Hayes (1950) showed that the current tended, wherever started, to go diffusely through the brain, favoring slightly the basal structures.) At the appropriate time the animal was killed by neck-break, both adrenals at once removed, carefully freed from fat, weighed to 0.1 mgm. on a torsion balance, and ground to a smooth powder in 1 gm. of anhydrous sodium sulphate. (Tests showed that in this condition the cholesterol was stable practically indefinitely.)

The cholesterol was extracted by chloroform, and as our method had some novel features and proved rapid, simple, and accurate, it will be described in detail. Extraction tubes were made to the size and shape shown in Fig. 2, which shows the extraction in progress. The lower end was stopped with a small plug of grease-free cotton-wool (shown heavily shaded), which retained the sodium sulphate-adrenal powder (stippled). 5 ml. of chloroform was then added on top (light shading) and the cholesterol eluted.

Experiment 1.

Before the method was adopted, tests showed that the extraction was rapid and complete. By collecting the eluate in successive portions it was found repeatedly

that the first half ml. contained at least 95 per cent. of the cholesterol, and that the second half ml. contained the remainder. No trace could be found in the subsequent portions, tested at each half ml.

The eluate was adjusted to an exact volume, an aliquot taken when the rats were female (for their adrenals contained about twice the amount contained by the males'), the colour developed with acetic anhydride and sulphuric acid, and the estimation made photoelectrically. Both "blank" and "standard" tubes always accompanied each batch.

After these preliminaries there arises the question of how to measure the cholesterol's fall: what shall serve as control? Obviously, the ideal would be the same gland before the convulsion, but this, of course, was impossible, for the first analysis necessitated its destruction. We therefore considered the possibility of using the same animal's other adrenal, one being removed before and the other after the convulsion. (The fact that the left gland contains, on the average, more cholesterol by 9 per cent. must be borne in mind here.) We therefore explored the possibility of using the rats in pairs, removing the right adrenal from one and the left from the other before convulsion, administering the E.I.C., and then, at the appropriate time later, removing the remaining adrenals, left and right, thus providing

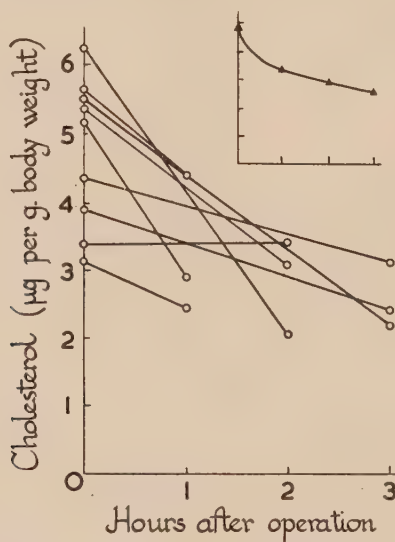


FIG. 3.—Changes in the cholesterol content of the remaining adrenal after unilateral adrenalectomy. The small graph inset shows the changes of the average. Immature rats.

a pair of observations that were balanced for laterality. The method, however, requires that each animal be anaesthetized and operated on prior to the E.I.C., and it is well known (Venning, *et al.*, 1944; Talbot *et al.*, 1947) that such treatment is likely in itself to cause a secretion of A.C.T.H. and a lowering of the adrenal cholesterol. As, however, the method would be valuable if it could be made to succeed, its possibility was tested.

Experiment 2a.

Eighteen rats were selected as nine carefully equalized pairs. Each pair was anaesthetized with ether and the right adrenal taken from one and the left from the other by the lumbar route. No convulsion was given. At 1, 2, or 3 hours after the operation (three pairs at each time) the rats were killed and the remaining glands at once removed. All were assayed for cholesterol in the manner described, and the results were examined for any fall in cholesterol due to the disturbing effect of the anaesthetic and operation. The results are shown in Fig. 3, in which each circle-ended line shows, at its left-hand end, the amount of cholesterol at the operation

and, at its right-hand end, the amount in the contralateral glands of the same two rats at the indicated time later. The figure shows that all pairs but one lost cholesterol from their adrenals in the first few hours after the operation.

These rats were immature, with weights between 43 and 49 gm., for we were interested at the time in their use; there remained the possibility that adult rats might yet prove usable, so a further experiment was performed.

Experiment 2b.

Six batches, each of six rats closely matched for family, age, and weight were taken, three of the batches containing males only and three females only. Each batch was treated in the same way: the six rats were divided into three pairs; each pair was adrenalectomized as before, and at 1, 2, or 3 hours after operation the remaining adrenals were removed; all were assayed for cholesterol. For expressing the results the scale of Fig. 3 was not satisfactory, for the females, as was expected, gave about twice the quantity given by the males. Each batch, however, being uniform in sex, is comparable within itself, so the results were reduced, for Fig. 4,

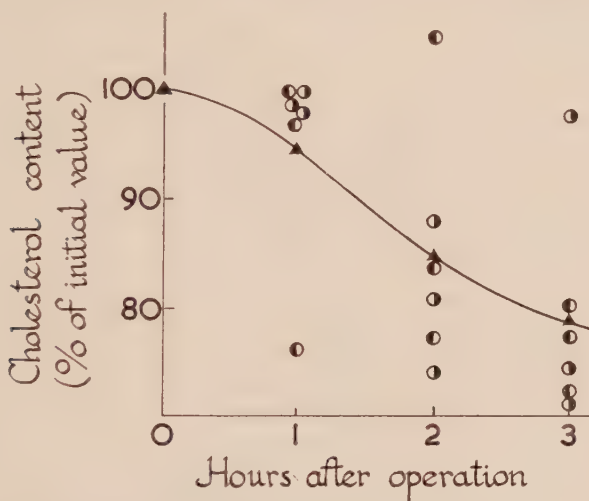


FIG. 4.—Changes in the cholesterol content of the remaining adrenal after unilateral adrenalectomy. Mature rats. Each circle is the average of two rats: O, female; ●, male; ▲, average of 12 rats.

to the common scale that takes the initial values as 100 arbitrary units. The sexes have been indicated in the figure: inspection shows no particular difference between the sexes in their *relative* responses. The trend, shown by the continuous line through the averages, is clearly downwards. The two experiments (2a and 2b) thus show that the operation of adrenalectomy, with its accompanying anaesthesia, is a significant diminisher of the adrenal cholesterol.

We were thus forced to use, as control for the test rat, another rat. This allows the variance between rats to come in as experimental error; but we could find no way of avoiding this. The effect was, however, minimized by arranging that the test rat and its control should always be selected to be closely similar, and by ensuring that all averages and other statistics were based on a generous number of animals.

Our next step was to find at what time after E.I.C. the adrenal cholesterol became minimal, for estimations made at that time would not only be maximally sensitive but would also be least affected by disturbances which shifted the minimum.

Experiment 3.

As a preliminary exploration, rats, adult and of both sexes, were given an E.I.C. and at various times later, from 0 to 24 hours, were killed and the adrenals assayed, right and left separately. The amounts in the two glands were then added, and the

result for each animal expressed as $\mu\text{g.}$ of cholesterol both per gm. of body weight and per mgm. of adrenal weight. The two forms behaved similarly with time, and the results for the former are shown in Fig. 5, in which the time-scale has been distributed non-linearly for clarity of display. The two sexes have been indicated separately to show any difference of trend. These differ in no essential, and the results for the thirty rats show that, to a first approximation, the minimum does not occur until 4 to 5 hours after the convulsion, and that it lasts for some hours.

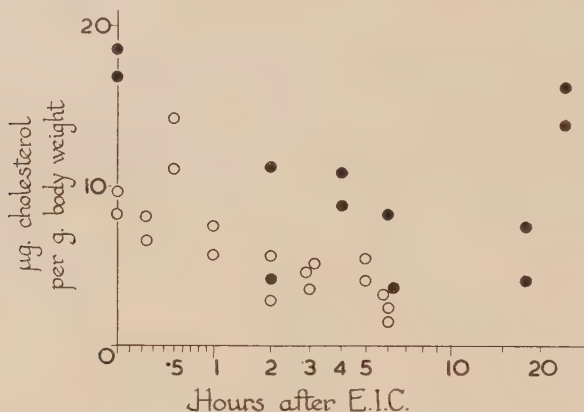


FIG. 5.—Changes in adrenal cholesterol after E.I.C. Adult rats; ●, female; ○, male. (The abscissae are graduated as $\log_{10}(1 + \text{time})$ in order to space the results more suitably.)

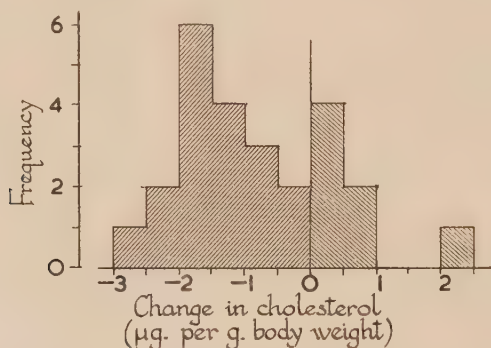


FIG. 6.—Changes in adrenal cholesterol four hours after E.I.C. A shift to the left implies that the amount fell.

This experiment was sufficient to indicate the appropriate time for the removal of the adrenals after E.I.C., but it was intended only as a preliminary survey, so we arranged a further experiment to show specifically the effect of E.I.C. on the adrenal cholesterol.

Experiment 4.

Twenty-five pairs of rats, all male and adult, were accurately matched and the two of each pair were treated similarly in almost every way, each rat being taken through the routine for the giving of the shock (100 V. for 0.1 second), but to only one of the pair was the shock actually given. Four hours later both were killed and the cholesterol assayed as usual. From each pair was found the quantity "cholesterol in the convulsed less the cholesterol in the unconvulsed rat" (both expressed as $\mu\text{gm.}$ in both adrenals per gm. of body weight). Taking the difference in this way makes the result, of course, independent of variations between pair and pair, such for instance, as were bound to occur between one day and another; for the whole experiment, with its fifty rats, was necessarily spread over a number of days.

The changes following the convulsion are shown in Fig. 6, which shows the tendency for the change to be negative, i.e., for the adrenal cholesterol to *fall* after E.I.C. The fall, as an average, was from 5.84 (μ gm. cholesterol in both adrenals per gm. body weight) to 4.97, a fall of 15 per cent. The trend, though not showing in every pair, is statistically significant, for t is 3.63 and P is less than 0.002.

Although these results showed that E.I.C. would cause the adrenal to lose cholesterol, the loss was not large, and we decided to test whether a more prolonged shock would give a larger effect. The experiment was also of interest in view of the variety of opinions that have been expressed about the amount of shock that is optimal therapeutically.

Experiment 5.

Adult male rats were associated into accurately matched triples, and each of the triple was treated similarly except that one had a shock (at 100 V.) of 0.1 second, one had a shock of 1.0 second, and one had the electrodes placed but no shock. Four hours later the animals were killed by neck-break, and the adrenals, after rapid weighing to the nearest 0.1 mgm., were assayed for cholesterol. The triples were used because there were far too many animals to be taken through as a single batch; in fact, the experiment occupied some weeks. The three rats of a triple, however, could be taken through in one day and almost simultaneously, so they provided accurate controls for each other. The comparisons (i.e., differences) between rats in the same triple (though not the absolute values) could thus legitimately be combined and compared, being free from those effects that make one triple uniformly different from another. As the control for one rat's response was simply another rat, the comparatively large number of 48 triples (144 rats) was used, so that the standard error of the final averages should be sufficiently small.

When the results were examined, it was found that the variance in the different classes did not seem to be homogeneous, those with more cholesterol tending to have a larger variance than those with less; evidently, as often happens in biological material, it was the coefficient of variation, rather than the variance, that tended to be uniform. The uniformity required for the analysis of variance was therefore obtained by a transformation of the weights of cholesterol to their logarithms. This transformation was used for all the data from this stage onwards. It does not really add any complication, either conceptual or mathematical; for it amounts, when we compare "test" and "control," to our finding by how much per cent. the one exceeds the other instead of by how much in weight.

The experiment was also planned to provide information on another question. From the inception of the work there had been some doubt about the best way of expressing the results of the assay for cholesterol, which could, for instance, have been expressed "per rat," or "per gm. of body weight," or "per mgm. of adrenal weight," and so on. Some experimenters still decide such questions by selecting one of such forms arbitrarily, probably because they are not acquainted with the statistical principles involved; but there is now no doubt that the best method is that the experiment should be arranged so that the results themselves can declare which form is best. In our particular case previous testing had shown that results given as " μ gm. per gm. body weight" had no advantage over the simple " μ gm. per rat." Also, in most of the experiments each pair or triple, which alone provided the basic comparisons, was uniform for body weight, the members having been selected to this end. "Correction" for body weight was therefore unnecessary. The status of "adrenal weight" was, however, less clear. The adrenal weight not being known till after death, the selection of rats for adrenal uniformity was not possible, so some correction seemed called for; but whether the correction should be a simple weight-for-weight adjustment, or any other, was not known. Fisher (1935), however, has shown that the proper method is to use the variable (e.g., adrenal weight) as concomitant, and then, by an analysis of the covariance, to deduce from the experiment itself what correction, if any, is appropriate. This method was used in this and the next experiment (Expts. 5 and 6). Experiment 5 showed, if I may anticipate its results, that the gland's weight, when all other sources of variation had been allowed for, was not significantly correlated with its content of cholesterol, the actual value being -0.088. (Its square was 0.0077, which means that less than 1 per cent. of the variance in cholesterol content could be associated with the variance in weight.) Evidently the variation in weight was due mostly to water, or to some substance or tissue not causing a variation in the

content of cholesterol. What little correlation there was, was negative, showing how wrong would have been the application of the commonly, and thoughtlessly, applied "correction for weight." From this point onwards, therefore, we used, as main variable, the logarithm, to the base 10, of the total weight of cholesterol.

The analysis of variance of Experiment 5's main results is shown in Table I. The sources of variation are: (a) that between Triples, which includes all the sources

TABLE I.—*Expt. 5: Analysis of the Variance of "Log (Cholesterol)."*

Variance.	D.F.	Sum of sq.	Mean sq.	F.	P.
Triples	47	1.01259	21.54×10^{-3}	2.51	<0.001
Durations	2	0.10323	51.61	6.00	<0.01
Residual	94	0.80794	8.60	—	—
Total	143	1.92376	—	—	—

to which the triples were exposed differentially, e.g., that two triples differed in the day on which they were experimented on; (b) that between Durations, which includes the different effects of giving no shock, a shock of 0.1 second, or a shock of 1.0 second—the main interest of the experiment; and (c) Residual, all the other factors which might make one member of a triple differ from the other two members. The right-hand column shows that the variation due to Triples was highly significant, showing that the carrying of the experiment through in small uniform batches (each of three rats), each with its own internal controls, was well worth while as an eliminator of errors. Further, the effects of the different shocks is clearly significant, with P less than 0.01.

The analysis shown, however, while essential as a preliminary, does not yet show exactly what we are interested in. The two degrees of freedom for "Duration" consist both of the effect of giving an E.I.C. (as contrasted with not giving one) and also of the effect of prolonging the current-flow from 0.1 to 1.0 seconds. These two effects, each a single degree of freedom, can be separated. Thus, if x , y , and z are the results in one triple of no shock, shock of 0.1 sec., and shock of 1.0 secs. respectively, then the linear function, $u = 2x - y - z$, will measure the effect of the shock, and the second linear function, $v = y - z$, which is orthogonal to the first, will measure the effect of the prolongation. These quantities were calculated for the 48 triples, and their sums of squares found to be, for u , 0.0950, and for v , 0.0082. (The fact that they sum to 0.1032 checks both the reasoning and the arithmetic.) Of these, u is significant with P equal to 0.001, while v is quite insignificant. Clearly the important factor is the giving, or not giving, of E.I.C.: how long the current passes makes no detectable difference to the adrenal cholesterol.

This last deduction was of some interest, for the actual average contents (as logarithm) in the three classes were in the ratios: no shock: 100, 0.1 sec. shock: 65, 1.0 sec. shock: 75, and it seemed possible that the increased shock might actually cause less response, perhaps by some paralysing effect. The tests of significance show, however, that there is no evidence for a reversal.

To sum up the results of this experiment. The main fact is that the degree of freedom u , the comparison of the shocked with the unshocked rats, is significant with P equal to 0.001. The experiment thus demonstrates decisively that an E.I.C. lowers the cholesterol content of the rat adrenal. Minor results are that the duration of the electric current, within the range 0.1–1.0 seconds, makes little difference.

THE EFFECT OF HYPOPHYSECTOMY.

Only one cause is known to be efficacious in the lowering of adrenal cholesterol: a secretion of A.C.T.H. by the adenohypophysis. In order to test directly whether this really was the cause of the fall, a new set of experiments was devised on the basis that if such a secretion was the cause of the fall, then the fall should be prevented by a previous hypophysectomy.

Before the new experiments were commenced, it was clear that careful consideration would have to be given to their design. Thus, if we take it as axiomatic that the new experiments must include a complete set of controls, at least four groups of animals will be required. First, to demonstrate that the E.I.C. is having an effect, there will have to be two groups, which can be called A_c (the convulsed) and A_0 (the unconvulsed); then these two groups will have to be contrasted, in their adrenal cholesterol contents, with two hypophysectomized groups, B_c (the con-

vulsed) and B_0 (the unconvulsed). Then if the A 's do show the effect of E.I.C. and the B 's do not, the effect of the hypophysectomy will have been demonstrated. The logical structure thus demands, apart from replication, four animals to the unit—one each of A_0, A_1, B_0, B_1 —and this basic structure must be retained through any further complications.

In technical language the experiment tests for an interaction. In the usual notation (Fisher, 1935; Yates, 1937), if H is the factor that can take the two values H_0 and H_1 representing "normal" and "hypophysectomized" respectively, and if C can take the two values C_0 and C_1 representing "not convulsed" and "convulsed" respectively, so that any particular animal's condition is represented by giving values to i and j in $C_i H_j$, then the interaction will be measured by the linear function

$$C_1 H_0 - C_0 H_0 - C_1 H_1 + C_0 H_1;$$

for this compares the effect of convulsion in the normal animals, $(C_1 - C_0)H_0$, with its effect in the hypophysectomized, $(C_1 - C_0)H_1$. The null hypothesis then is that the values of this linear function, each value derived from the adrenal cholesterol of four rats, do not, on the average, differ significantly from zero.

In addition to the factors C and H , and their interaction CH , we wished to take into account the possibility that the feeding of the animals in the few hours before the experiment might be an important factor, partly because of our own chance observations, and partly because Henriques *et al.* (1949) had shown that rats on high protein diet seemed to be particularly sensitive to lyophilized anterior pituitary extract. (That they were observing chiefly the action of the A.C.T.H. in the extract is clear from the fact that they were observing its power to deplete the adrenals of ascorbic acid.) As our experiment would in any case have to contain much replication (to lessen sampling irregularities), and as there was no prior knowledge of whether it was better to feed or to starve, we decided that variation of this factor should be introduced deliberately. In addition, as there was some uncertainty about the best time for examining the adrenals (the number of hours after the shock) and as the other factors, e.g., hypophysectomy, might interact with this, rendering the previous estimate of Expt. 3 inaccurate, variation of this factor seemed advisable. We decided therefore to investigate all sixteen combinations of the four factors, each at two values:

C : Unconvulsed (C_0)/convulsed (C_1) animals;

H : Intact (H_0)/hypophysectomized (H_1) animals;

F : Those fed *ad lib* throughout (F_0)/those starved overnight and until operation (F_1);

T : Those killed three hours after convulsion (T_0)/those killed five hours after convulsion (T_1).

(For convenience of explanation, the sixteen animals necessary for the sixteen combinations will be referred to throughout as a "set.")

This arrangement, though giving a thorough exploration of the relevant factors, raised difficulties in that it required that sixteen animals should be taken through the experimental procedures together. With our resources this number was, in our opinion, too large to be treated uniformly; in particular, the set was too large for all the animals to be taken through the procedures in the same day; and we were of the opinion that, in work such as this, it is desirable that comparisons should be made only between animals that were treated within the same hour. The question therefore arose whether the modern technique of confounding could not be used advantageously. In fact, using the notation above, we were interested primarily in the interaction CH , and secondarily in the higher interactions CHF , CHT , and $CHFT$ (for these were needed to interpret the significance of CH); but our interest in some of the other factors and interactions was slight, so they could advantageously be confounded, preferably in the "partial" form, so that information on these factors and interactions was not lost totally. On considering the circumstances it was considered that a good balance would be given by using sixty-four rats in four sets of sixteen, and by confounding:

- in set 1: H, F , and HF
- „ 2: C, T , and CT
- „ 3: T, CF , and CFT
- „ 4: H, FT , and HFT .

(This arrangement obeys the mathematical necessity that, if P and Q are confounded their interaction PQ shall also be confounded.) It gave a much improved experimental design, for each batch that must be kept homogeneous was reduced from sixteen rats to four, a number that could be taken through in one day with satisfactory uniformity. (I shall, from here on, reserve the word "batch" for such a four). Its disadvantages were, that the experiment had to be carried through in accordance with a somewhat complex schedule, a typical batch consisting of the four treatments $C_1H_0F_1T_1$, $C_1H_0F_1T_0$, $C_0H_0F_1T_1$, $C_0H_0F_1T_0$, and that the subsequent statistical analyses were more complex than usual; these however were trivial when balanced against the improvement in experimental accuracy.

One minor point calls for comment. Strictly, the experiment contains "dummy" comparisons, for a removal of the adrenals at a nominal 3 hours after "no convulsion" is not factually different from a removal at 5 hours after the same null operation. Had there been no confounding, these comparisons would have been isolated in the usual way and added to the residual variance; but the presence of confounding, especially as it is partial, makes the analysis very complex; and as the effect is in any case trifling, it seemed simpler to ignore this complication, which occurs in only a fraction of the comparisons.

So much for the design. With regard to the operative details, the hypophysectomies were performed by the pharyngeal route, under ether anaesthesia, with the technique of Smith (1926) as basis. When each rat was eventually killed, the pituitary fossa was examined under the dissecting microscope: if any pituitary tissue was found remaining, that batch of four rats was discarded and the batch repeated.

Experiment 6a.

This experiment, on sixty-four rats, was completed, but no great confidence was felt in the results, for the operative and other techniques had but recently been learned. A repetition of it (Exp. 6b) was therefore performed, and then, when it was clear that the techniques were fully mastered, a third (Exp. 6c).

The results of each of these experiments (6a, b and c) were examined in full statistical detail by the analysis of their variance and covariance, with "adrenal weight" as concomitant. Its 63 degrees of freedom were analysed into 16 single degrees of freedom corresponding to the main effects and their interactions, which includes the focus of interest, CH ; 15 degrees of freedom, which need not be further subdivided, between the batches; and 33 residual. The discussion of the results is best preceded by the elimination of some minor topics.

"Adrenal weight" can be dismissed at once, for the three parts of Expts. 6 showed, as did Expt. 5, that it contributed no useful information towards the main effects that we were interested in. The three partial correlations, all other variables and factors being held constant, were $+0.332$, -0.029 , and -0.231 . As the average value is $+0.024$, markedly less than its standard error, there is no evidence of appreciable correlation. Evidently the factors that varied the adrenal weights did not affect their content of cholesterol.

The factors F and T were not only insignificant in themselves but proved to have no significant effect on the CH interaction; for the interactions CHF , CHT , and $CHFT$, even when tested over all the 196 rats, were insignificant. These factors need not, therefore, be considered further.

A possible source of error is that the hypophysectomy may so cause the adrenal to atrophy, or its cholesterol content to fall, that the adrenal becomes unresponsive to A.C.T.H. The average changes after hypophysectomy, with their standard errors, were found from the results and are shown in Table II (in arbitrary units). It will

TABLE II.—*Effects of Hypophysectomy.*

		On adrenal weight.	On cholesterol content.
Expt.	6a	-0.22 ± 0.46	$+3.8 \pm 2.0$
	6b	$+0.15 \pm 0.54$	$+7.2 \pm 2.1$
	6c	$+0.60 \pm 0.61$	$+5.5 \pm 2.7$

be seen that the effect of hypophysectomy on the cholesterol content is to increase it significantly, the increase being probably due to the lack of circulating A.C.T.H. and to the consequently decreased mobilization. Its effect on adrenal weight is equivocal, but at least there is no marked fall. If therefore E.I.C. fails to cause a fall of cholesterol in the hypophysectomized animals, the failure cannot be due to any lack of cholesterol in their glands.

One other preliminary question remains. At one time it was thought that the rats' body weights might have some relation to their response to E.I.C. The protocols of Expts. 4 and 6 were therefore re-examined, for each rat's body weight was always recorded. The product-moment correlation between weight and response was found in each homogeneous group, and the correlations examined as a set. No bias was found, so the facts showed no reason for thinking that body weight played any significant part.

We can now turn to the main question that Experiments 6a, b, and c were intended to answer: the effect of hypophysectomy on the reaction to E.I.C. The results for the three experiments are shown, first by the analysis of variance in Table III, and then in Table IV, which shows the average values so that the sizes and directions of the changes can be seen.

TABLE III—Expt. 6: Analysis of the Variance of "Log (Cholesterol)."

Variance or factor.	D.F.	Sum of sq.	Mean sq.	F.	P.
C	1	136×10^{-6}	136×10^{-6}	—	—
H	1	288204	288204	16.6	<0.001
CH	1	58451	58451	3.38	>0.05
F	1	11201	11201	—	—
CF	1	36736	36736	2.12	>0.05
HF	1	1	1	—	—
CHF	1	6188	6188	—	—
T	1	17334	17334	—	—
CT	1	25676	25676	1.48	>0.2
HT	1	20626	20626	1.20	>0.05
CHT	1	278	278	—	—
FT	1	27792	27792	1.60	>0.05
CFT	1	47669	47669	2.76	>0.05
HFT	1	1	1	—	—
CHFT	1	713	713	—	—
Sets	11	754389	68581	—	—
Batches	36	1196993	33250	1.92	<0.01
Residual	129	2232019	17302	—	—
Total	191	4724408×10^{-6}	—	—	—

TABLE IV.—Average Values of Log (Cholesterol) in Entire (H_0), Hypophysectomized (H_1), Unconvulsed (C_0), and Convulsed (C_1) Rats.

		Experiment.							
		6a.		6b.		6c.		All 6.	
		H_0	H_1	H_0	H_1	H_0	H_1	H_0	H_1
Convulsion	C_0	.313	.321	.245	.290	.236	.286	.265	.301
	C_1	.277	.345	.211	.297	.252	.314	.247	.319

The average over all the three parts of Experiment 6 is shown in the two right-hand columns of Table IV. Each quantity is not a direct measurement but a reconstruction from somewhat complex comparisons, involving a variety of balanced controls. In these four values something of the expected result is shown; for in the unoperated animals (H_0) the effect of a convulsion is to make the content of cholesterol (on the logarithmic scale) fall from 0.265 to 0.247, while in the hypophysectomized (H_1) no such fall occurs (there is actually some increase from 0.301 to 0.319). Neither of these effects, however, can claim statistical significance; for as the four quantities are each based on 48 rats, and as the average variance per rat (Table III) is 0.0173, so the variance of each quantity (under "All 6") will be $0.0173/48$, i.e., 0.00036, and its standard error 0.019. The results thus show changes in the direction expected, but not amounting to statistical significance. It seems clear, therefore, that though hypophysectomy lessens, or counteracts, the effect of convulsion, the factors responsible need further elucidation.

SUMMARY.

The paper describes experiments intended to elucidate the mode of action of electro-convulsive therapy. In particular it reports how convulsion, in the rat, affects the adenohypophyseal-adrenocortical system.

The experiments showed that:

- (1) Anaesthesia and unilateral adrenalectomy leads after a few hours to a fall of the cholesterol content in the other adrenal.
- (2) The fall occurs in both mature and immature animals.
- (3) The weights of the adrenal glands and of the whole body were found, throughout the experiments, not to be correlated with the gland's cholesterol content.
- (4) An electrically induced convulsion causes the adrenal cholesterol to fall.
- (5) Variation of the inducing shock from 0.1 seconds to 1.0 causes no significant variation in the fall.
- (6) Hypophysectomy lessens the effect of the convulsion, but the factors need further elucidation.

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PHANTASIES OF BIRTH AND PRENATAL EXPERIENCES RECOVERED FROM PATIENTS UNDERGOING HYPNOANALYSIS.*

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INTRODUCTION.

IN this paper, which is a preliminary communication, I want to present and discuss phantasies of the process of birth and of life before birth, which emerged from certain patients undergoing hypnoanalysis.

The paper falls into three parts. I must start by outlining very briefly that conception of analysis and its technical application which led to the expression of these phantasies. Then I would like to give some illustrative extracts from cases. Finally, I would like to submit some ideas about the significance of the phenomenon as a whole and its future application.

In the early days of his life, in his relationships with his parents and siblings, an infant will find himself in circumstances which will form the prototypes of all the important emotional situations which he encounters subsequently. He will experience love and hate, hope, desire and fear, frustration and aggression. Sooner or later he will react to some situations by repressing them, together with their associated affect. Once this has occurred, the unconscious part of his mind is ever alert to detect in the subsequent events of reality a symbolical significance relevant to some aspect of the repressed material. When it does detect such a symbolical significance, the repressed affect becomes reactivated. It is this reactivated affect which may force upon the individual thoughts, feelings, or behaviour of neurotic type.

In treating a patient we may be able to influence favourably factors in his environment. In the present state of our knowledge we cannot influence his essential psychological constitution. Often enough, therefore, we must concentrate our therapy upon taking the sting out of the repressed material.

The limitations of infancy cause the infant to attach a significance to an event which to the adult appears to be out of all proportion. For example, to an infant, if the mother is absent, this may mean that she is dead.

Unfortunately, once an incident and its associated affect have been repressed, they are out of reach of subsequent modification by reality, and if years later the repressed affect is reactivated, it will be found to have lost little, if any, of its original intensity. If the repressed material, *with its associated affect*, can be raised to consciousness and there reviewed by an adult mentality, then the triviality of the incident will become apparent, and its powerful affect will vanish. Further, it is only while it is in the unconscious that the incident has this power to force a "complex-determined" response upon the individual. To raise this material to consciousness is part of the purpose of analysis.

More important than raising to consciousness a repressed memory, though this is an essential preliminary, is the raising to consciousness of the phantasies surrounding it, which were possibly never fully conscious at all. Here is an example:

A two-year-old girl was taken into her mother's bedroom to see for the first time her newly-born brother. She saw him nestling in his mother's arms. As she was looking at him she was noticed to be suffering from the rash of measles. She was hurriedly taken away from the bedside and isolated in her own room. The sight of her brother in *her* mother's arms had awakened in her great resentment, not all of which reached consciousness. She phantasized the measles rash as the outward evidence of her aggression, and it seemed to her that it was on

* A Paper read at the Autumn Meeting of the South-Western Division of the Royal Medico-Psychological Association held at Park Prewett Hospital on 16 October, 1952.

account of this aggression that she had been rejected by the family. After this, whenever she felt that her brother was being favoured at her expense, she repressed the major part of her aggression. At the age of twelve she began to suffer from recurrent episodes of severe depression. She felt also that her brother found especial favour because he was a boy. This led her to develop phantasies of identification with males and of aggression towards them. As a result she later found great difficulty in making a satisfactory heterosexual adjustment.

In hypnoanalysis one makes use of a combination of techniques. Of these, when it is possible, as it frequently is, the most fruitful is the technique of "Regression." Under hypnoanalysis many patients are able to relive earlier periods of their lives as vividly as though they were experiencing them for the first time in reality, and with their minds in the same state of immaturity. Further, they are able to bring to their altered state of consciousness the secondary feelings and phantasies to which I have referred. On bringing them back to the present day and terminating hypnosis, they retain all this material in consciousness and are able to review it from an adult standpoint.

As one listens to a patient one seeks to discern something which, interpreted in Freudian terms of psycho-dynamics, could be a symbolical repetition of the type of infantile situation which probably lies at the root of his psycho-pathology. One takes this incident and tells the patient that at a given signal he will find himself back in an earlier scene of his life which had the same emotional values. This scene is explored and then, with the same formula, he is regressed again. This procedure is repeated until the episode is reached, exploration of which results in the relief of his symptoms. This process may, of course, be opposed by every conceivable manifestation of resistance, and one may need to have recourse to every kind of analytical manoeuvre.

It was while practising this form of regression upon a case that a point was reached when one had logically to expect that at the next stage the patient would find herself back in the womb, and this is indeed what happened.

ILLUSTRATIVE EXTRACTS FROM CASES.

The first extract is from the case, treated in the summer of 1950, which provided my first experience of these phantasies.

Case No. 1.—Miss F. S.—, aet. 44; single.

This lady suffered from chronic alcoholism. She was transferred to us from another institution, where she had been admitted in the throes of an attack of delirium tremens. By the time she reached us this attack had completely subsided, and she was anxious to undergo analysis in the hope of gaining relief from her alcoholic tendencies. She proved easily hypnotizable and readily amenable to regression. It soon became clear that her basic trouble was an intense feeling of insecurity, which dated at least from her breast-feeding days. Her drinking was a substitute for the breast.

At one session I asked her to see a picture which we might take as the starting-point of that session. She saw a picture of the sand dunes which she used to see from her bedroom window at home. In my mind the train of ideas flashed: "Sand dunes—shifting sands—here to-day and gone to-morrow—an excellent symbol of insecurity—worth exploring." Accordingly I told her that at the count of "ten" she would find herself back in a situation which had for her the same emotional significance as these sand dunes. (I should perhaps explain that I had no idea what, if anything, would come next.) I reached the count of ten and asked her where she was. She replied, "I am thirteen—at school. All the other girls are wearing summer frocks, but I am still wearing a winter one. I feel very embarrassed and out of place." I asked her to go back still further: "I am five. I am at a party and I want to go to the lavatory, but all the grown-ups are strangers and there is no one I can ask. I feel hot and sticky and uncomfortable." Still further back she finds herself in the basket of her brother's bicycle. He is taking her for a ride and swerving too fast round a corner. She feels very unsafe. At six months old she is in her pram, being taken for what seems to be her first ride outside in the dark. The way lies through an avenue of pine trees which are swaying and creaking in the wind. She fears that one will come down on top of her, and is very frightened. At the age of three weeks she has earache, and her mother is putting her nipple in her ear to soothe it. I ask her to go even further back to a time when she felt the same tone of emotion. She says, "I am very tiny. I seem to be lying on something very soft and white. I am very comfortable but somehow it is not right. I used to be part of a "oneness," and now I am separated. At this I told her that at "ten" she would find herself again part of the "oneness." As I reached "ten" she said quite calmly and quietly and positively, "This is the womb." She went on: "There is something beating in me and through me—my

mother's heart. I can't see—and it feels as if I've got no mouth." I asked her in what position she found herself. She replied, "Curled up," and immediately assumed the foetal position.

After some time I told her that at the count of "ten" she would start to leave this place. At "ten" she arched her back, put one hand on her head, and an expression of severe suffering appeared on her features. She was portraying in fact exactly what one can imagine that the foetus feels when the first contraction of the uterus clamps down upon it. In a moment or two this attitude was relaxed, only to be repeated a few moments later. At length I told her that at "ten" she really would leave this place. At "ten" she began to moan from the pain in her head, and then, just as one felt that the head must soon emerge, she suddenly gasped, "I can't breathe," and she appeared to be fighting for air. Then came a short period of gasping and gulping, interspersed with cries that she could smell blood. It was distressing to witness. Then she suddenly gave a great sigh of relief—"That's better"—and appeared to fall asleep. She retained the foetal position. In due course I told her that I would count up to "twenty," and as I was counting she would grow up to the present day. She relinquished the foetal position spontaneously at "five." Once back in the present day I slowly awakened her. She awoke complaining of a blinding headache, which was relieved by reinducing hypnosis and suggesting strongly that this time she would awaken without it.

At a subsequent session I regressed the patient back to the "oneness" and then asked her to go back to where she was before she reached the "oneness." There followed half an hour of extraordinary material. She appeared to find herself in a place which she described in incompatible superlatives. It was dark, yet filled with colours of indescribable beauty; there was complete silence, yet the place was filled with heavenly music; it was still, yet everything was quivering. And so on. She passed into a state of euphoria which was still present on awakening and which persisted for a day or two. This experiment was repeated on several occasions, always with the same result.

This analysis was never completed. Resistance was encountered, which I lacked the experience to overcome.

In retrospect I am left with the conviction that the insecurity behind this patient's alcoholism dated from the insecurity she felt when birth separated her from her mother. She failed ever to adjust adequately to this "trauma of birth."

Her failure to do so, since there was no evidence of anything exceptional in the circumstances of her birth, presumably indicates some weakness in her essential psychological constitution.

In the end she appeared to make a good social adjustment within the hospital, and discharged herself to a sheltered post. It has proved impossible to follow her up.

This patient had had opportunities in her life of acquiring obstetrical knowledge.

Case No. 2.—Mrs. M. M—, aet. 28; married, 2 children.

During the next twenty months phantasies of birth and of intra-uterine life emerged spontaneously from a number of cases of various types. I was interested in them, but failed to appreciate what I now believe to be their importance. Early this year the case now to be described came under treatment. It was the dramatic clinical improvement which followed their expression, and the gaining of insight into them which occurred in this case which really opened my eyes to their significance.

Questioned after these phantasies had emerged, Mrs. M— professed complete ignorance of the biological facts of life, and this in spite of the fact that she had borne two children. It is possible that this ignorance represented some form of hysterical amnesia, but I find this difficult to accept. She had apparently no knowledge of the existence or function of the umbilical cord. The navel was "something which happens when you are born." She was under an anaesthetic when her children were born and was therefore unable to say whether anything but the child emerged from her. I am quite sure she had no knowledge of spermatozoa or ova, or the process of conception.

Mrs. M— was born and brought up in the South of England. In 1945 she married a Scotsman and went to live with him in Scotland. Towards the end of 1951 she became very depressed and came south to visit her family. Through their doctor she came to consult me. In the faint hope of a quick result I gave her a short course of E.C.T. She did improve slightly, but soon relapsed and was admitted to hospital for analysis. She proved easily hypnotizable, and regressed spontaneously to one scene after another of early childhood in which her mother had treated her exceedingly unkindly. She then developed a thrombosis in her leg and treatment had to be suspended for several weeks.

On resuming the analysis she confided to me that her real trouble was a profound fear of anything to do with sex. Sexual intercourse was a terrifying business for her; she even had to leave if a conversation turned upon sexual matters.

Under hypnosis she soon regressed to a scene in which she felt she had just been born. She was choking from something wound tightly round her neck. She had no idea what this could be. I asked her to trace it. Her hand went up to her neck and then, as though she were running something between finger and thumb, it wandered down to the region of her navel—"It comes from my tummy." A few moments later she said that a man was injecting something into her arm. She saw both the constriction round her neck and the

injection as attempts on the part of her mother to get rid of her. As she grew up any injection, and anything which could possibly symbolize an injection, had for her a complex significance which filled her with terror. Sexual intercourse fitted easily into this pattern.

The next question was raised by the patient herself, and she felt that she could not get better until it was answered. It was the question of the origin of her idea that her mother did not want her. Under hypnosis she told me that she was certain that this idea had originated before her birth. I regressed her therefore to the intra-uterine state. At once she appeared to be in great distress and moaned, "I'm burning! I'm burning!" Asked where she felt this sensation she replied quite definitely that it was in her stomach. I asked her to see something which would tell us how long she had been inside her mother. She saw a "seven," and then the word "months." She was quite certain that the burning was due to something which her mother was doing to try to get rid of her. I told her then that if she had ever felt anything like this before, she would now go back to that experience. I counted up to "ten" and again she moaned that she was burning. This time she was equally definite that the pain was in her head. I asked her how big she was. In a very faint voice she replied "Very tiny." She said that she was unable to move her arms or legs. Again I asked her to see something which would indicate how long she had been inside her mother. This time she saw a "six," which referred to six weeks. Again she was quite certain that the burning was due to an attempt to get rid of her.

At this point I told her that she would progress to the time of leaving her mother. As I was counting she suddenly began to look worried. I asked her what was wrong, and she replied she felt that there was something round her neck. I asked her if she could tell me how long she had been inside her mother. The reply was "Five months." This is particularly interesting in view of the fact that the next patient, at the same date, also became aware of an intra-uterine body change.

As I reached the count of "ten," Mrs. M.— became very distressed indeed. She felt that she was in a tunnel that she was trying to get out of but could not. Then she felt someone get hold of her legs and pull them out. Then something hard and painful got hold of her head and began to twist it. Then she was lying on something white and felt she was choking from something round her neck. She was aware of a man and a woman, both dressed in white, and someone shrieking, "I don't want her! I don't want her!"

At this point we progressed her to the present day and awakened her. She recalled all that she had been through and insisted that it was as real to her as was the memory of her breakfast. She realized clearly what the experience was that she had been through, though she had no idea what it was that had been round her neck. She looked, and felt, utterly exhausted at the end of this session.

At the next session she greeted me with "Do you know, Doctor, I feel somehow that it was all my fault that my mother did not want me." She felt she had to know what it was that she had done wrong.

Under hypnosis she revealed again that it was something she had done before birth. We had already been back to six weeks *in utero*, so I asked her whether she had done this thing before she started to grow inside her mother or after. The answer came, quite calmly and positively, "Before." I asked her how far I must count for her to be able to return to this period. The answer, again quite calmly and positively was "A hundred."

I counted to a hundred and asked her what she could tell me about herself. In a voice which was less than a whisper she said that she was just a tiny spot. She could tell me no more than that, except that she was in a small place. Then she suddenly announced that she had moved to a larger place, and knew that she had to touch something which kept moving away from her. She knew that if she did not touch it she would die. Suddenly she did touch it, and was aware of a painful flash. She knew at once that this was the thing which she ought not to have done. She should never have touched this thing.

After touching this thing she began to grow bigger, though still remaining just a spot. Then she again lived through the first burning episode. At five months she again became aware of something round her neck. She omitted the phantasies of birth, but found herself again lying on a white sheet, with the man and woman in white. At this point I progressed her to the present day and woke her up. She awoke utterly exhausted and utterly bewildered. She said, "I know all that was real, but would you kindly tell me what it means?"

I had no doubt in my mind that she had been re-living her conception and her subsequent intra-uterine life. I did not want to suggest this to her and I tried, by appropriate questions, to lead her to the realization herself. However, her ignorance, as I have said, seemed on a conscious level to be complete. She seemed to have no understanding at all of the significance of the part played by the male and the female in reproduction. She had no idea how a baby *in utero* obtained its nourishment. At length I offered to tell her what I thought had been happening to her. She leapt at my offer.

Up to this time she had changed little from her condition prior to the start of treatment. Though seldom appearing severely depressed, she always looked listless. Though she always occupied herself, she never seemed to be interested in what she was doing. She seldom smiled, her expression was rather wooden. As I began to tell her about the

physiology of conception and so forth, an incredible look of enlightenment began to dawn on her face. She had not the slightest doubt that her experience as a tiny spot was a reliving of her preconception days, and that the "touching of the thing that was moving" was her conception. She exclaimed that now she knew what it was that she should never have done. She was never meant to be born, and realized that this accounted for the feeling which she had had all her life, that there was no place for her in the world. Then she realized spontaneously that though she had lacked a mother's love all her life, henceforth she could find all the love that she wanted in her husband.

By the end of my explanation she looked a different person. She was still exhausted, and remained so for three or four days, but she was absolutely radiant with happiness.

This state has persisted now for some three months. She left the hospital within ten days. I have heard from her once only, but she writes frequently to friends still in the hospital and members of the nursing staff. I would emphasize that she is in no way manic. She is completely in touch with reality. She has found a purpose in life and a joy in her husband and children which she had previously never dreamed of.

The mother of this patient was very antagonistic throughout towards the patient, to myself personally, and to my treatment by hypnosis, and this despite my best efforts to win her co-operation. However, some months after the patient had left the hospital I managed to persuade her to come to see me. She gave me these details.

From the moment of her own marriage she had been terrified of her own mother-in-law. She was still more terrified when she found herself pregnant with the patient, because her mother-in-law had threatened her with violence if ever she had a child. Throughout the pregnancy she was in a state of chronic fear. On several occasions her mother-in-law raised her hand to strike her.

She denies, not surprisingly, any attempt at procuring a miscarriage.

The child was delivered as a breech with extended legs, and was almost asphyxiated at birth from having the cord round her neck. She is sure that no instruments were used, and that the child was delivered by the midwife, no doctor or other male being present. She is sure that no injection was given at any time.

She does not recall ever having discussed the birth with the patient, but cannot be sure that the patient never overheard any conversation on the topic.

She confirmed the occurrence of an incident which played some part in the analysis, namely, the patient being knocked down by a dog at the age of one year. The child was terrified and screamed for some hours.

Case No. 3.—Mr. A. K—, aet. 25; single.

This young man suffered from an obsessional neurosis which permeated every action in his life. It was so severe that he had been unable to do a single day's work in his life. Of his many symptoms, two are relevant to our theme. The first was great difficulty in donning any garment which had to be pulled on over his head. The second was a lack of confidence that he could accomplish anything successfully with his hands. He proved easily hypnotizable and readily amenable to regression.

It soon became clear that he cherished powerful aggression against each of his parents. Much of this was at an unconscious level. This aggression he projected, and his obsessions represented defences against the attacks which this projected aggression led him to anticipate from every quarter. At an early stage in the analysis he was regressed along the line of the fear of putting anything over his head. Within a couple of sessions he reached an incident in which he gave his age as three weeks old. He found himself in a large bed, lying between his mother and the nurse, trapped underneath the bedclothes. He was unable to get out, and unable to attract attention. Breathing was becoming difficult and he feared that he was going to suffocate. Eventually the nurse discovered him and brought him to the surface. Many of his symptoms seemed to stem from this incident, and, not unnaturally I think, it was assumed that this incident was the origin of them. By the end of four months' treatment this incident had been well and truly dealt with, but we could claim little in the way of objective improvement.

His parents came for interview about this time, and his mother confirmed that this incident had actually occurred. She was positive that she had never spoken of it to the patient. She had been so ashamed of it that she had never told anyone of it. It was certainly news to her husband, sitting at her side. He was very indignant that he had never been told of it.

This case was being treated concurrently with the case of Mrs. M. M—. At this stage she had just expressed her phantasies of prenatal life. With this experience in mind I deliberately regressed this patient to his intra-uterine life. Quickly, albeit with more resistance than he had evinced over any situation hitherto, he regressed to an incident which he soon recognized was parental intercourse. From his description of his sensations it appeared that it must have occurred *a posteriori*, with his mother standing. He interpreted the experience as an assault upon him by his father, acquiesced in by his mother.

I begged his mother to come again to interview. She confirmed that this recollection was a possibility, since her husband invariably insisted upon the adoption of this position. She then volunteered that the circumstances of the patient's birth were peculiar. Labour had begun unexpectedly. Within two hours the head was born. Only the resident

midwife was present, and she found that she could not complete the delivery as the shoulders were causing obstruction. Hence the infant remained, with just his head born, for an hour or so until the doctor arrived and performed the necessary manoeuvres. She had never discussed this matter with the patient.

At the next session I regressed the patient to the womb again, and then told him he would relive the experience of leaving this place. He went through a detailed pantomime of exactly what his mother had told me had occurred. When he announced that he could not get his arms free I asked him to tell me what he was aware of concerning his arms. After a few moments he told me that his left arm was by his side but his right arm was trapped underneath his leg. He interpreted all this as his mother ejecting him into the cold world, where his hostile father was presumably lying in wait for him. Further, to ensure that he did not survive, she was depriving him of the use of his arms. This was the basis of his lack of confidence in the use of his hands.

With the emergence of this material objective improvement started. His work in the Occupational Therapy Department improved considerably.

One felt that it was still necessary to find the origin of his idea that his mother did not want him. Accordingly, I regressed him still further in his intra-uterine life. Amongst other things we find that at five months he is aware that his right arm is trapped under his right leg. Eventually he reached his conception, in which he saw himself as the ovum being raped, rather than wooed, by the over-anxious sperm of his over-anxious father. Though I have phrased this rather jocularly, I am in fact in earnest about its significance, though time does not permit me to go into this topic at length. Suffice it to say that following this session still more improvement was noticeable. He began to co-operate far more enthusiastically in overcoming the lifelong habit of obsessional thought and behaviour. For the first time in his life he began to do things which were distasteful to him, but which I had assured him were for his own good. In fact he began, for the first time in his life, to see in me, at a conscious and an unconscious level, someone on whom he could rely as being on his side. Also, though still unable to express overt antagonism towards me, he has started to use his symptoms from time to time as a weapon of aggression, and he has developed insight into this. In short, since we recovered this material he has turned from an apparently hopeless therapeutic prospect into a promising one.

DISCUSSION.

Freud himself stated that all anxiety originally derives from the anxiety at birth. Over twenty-five years ago Otto Rank wrote: "... we are led to recognize in the birth trauma the ultimate biological basis of the psychical." More recently Fodor, in *In Search of the Beloved* (1949), inferred, from the dreams and phantasies of his patients, references to all the prenatal incidents of which my patients have given what I believe to be direct evidence. For it is my belief that these so-called phantasies are in fact the reliving of events which were experienced and appreciated and promptly repressed. They represent, I believe, a form of recall of genuine repressed memories. Naturally they will have become distorted by time and contaminated by subsequent experience, as is the fate of all memories; but they are memories none the less, and as valid as memories from the age of, say, four or five years.

This belief naturally implies the further belief that the mind has powers of appreciation and recall hitherto unsuspected, or at least not seriously considered.

Clearly, every effort should be made to fit any apparently new phenomenon into the framework of what is believed to be fact before any extension of the framework is considered. So many people, if they care to consider this matter at all, will approach it from this angle that I feel quite justified in concentrating my efforts in the opposite direction.

To provide proof of my belief is clearly a difficult task. It is even difficult to decide what would constitute proof. Certainly it would be almost impossible to prove that any given patient had never heard or read or seen anything which might have inspired the phantasies, even if the occurrence of the events were independently confirmed. I feel that it is of the greatest importance that the nature of these phantasies should eventually be established beyond all doubt, not only from the scientific point of view, but also from the philosophical. But absolute proof of a theory is not essential before its application is justifiable. Each successful application is corroborative evidence of its validity, and one is entitled to believe in it until one is confronted with material which is incompatible. There is, after all, little universally accepted proof of any psychoanalytical theory. While realizing that they fall far short of proof of the truth of my assertion, I would submit the following points for consideration:

1. All these phantasies took their place quite logically in sequences of regres-

sions. Regarding the matter with an open mind one might well ask—"Why should the mind suddenly switch from factual situations to purely phantasy ones?" Our physical life in a continuum before and after birth, why not our psychical life also?

2. In the cases of Mrs. M. M— and Mr. A. K— we have definite confirmation that the relived experiences actually occurred, and there is a strong likelihood that they were never subsequently discussed with the patient.

3. Now that a definite attempt is being made to recover this material where it is felt to be important, many cases are producing it. The intra-uterine experiences of everyone presumably have much in common with one another, and it might not take much imagination to produce a fairly convincing pantomime of intra-uterine life. But almost every case also portrays a scene of inter-parental intercourse. To my mind, this would call for impossibly high universal powers of imagination. Since it probably was an almost universal experience, is it not easier to regard these phantasies as memories? Especially since the occurrence must be a noticeable break in the intra-uterine routine.

4. Conversely, that those phantasies which are peculiar to each case should have such a clear bearing on the symptomatic picture of that case surely suggests that they are founded on fact.

5. I feel that one cannot ignore the empirical fact of the very striking clinical improvement which has followed the recovery of such material.

The principal obstacle to the acceptance of these phantasies as memories is the materialistic view that there can be no psychical activity in the absence of a neurologically functioning brain. Now this is a view which I cannot share. I would echo Fodor's prophecy—"Prenatal psychology may shatter the last fetters with which scientific materialism has bound our minds." I believe that before the mind becomes imprisoned in a neurologically functioning brain, it is capable of an infinitely greater psychical activity. At this point I must venture into a little amateur philosophy.

Life, Mind and Soul seem to me to be different aspects of the same thing, and the terms are more or less interchangeable. I picture a vast reservoir or central pool of Life or Mind or Soul to which that portion of all Life which inhabits our body returns at our earthly death. The Life and Mind which inhabits each one of us consists, I believe, in a contribution from each of our parents plus a contribution from this central pool which is all our own. From material which has emerged in analyses I have come to suspect that each of these elements had the capacity to regard itself as "I." Once they have merged to form the mind of an individual, the "I" of one of these elements comes to dominate the other two. If this idea is considered, it will I think be found to be fairly well in accord with the known facts of genetics. The contribution which we receive from our parents derives of course from the contribution which they received from their parents, and so on backwards to the very origin of Life or Mind itself.

From the receptive point of view I see the mind as an endless reel of cinematograph film, its origin stretching back to the origin of Mind, and constantly and ceaselessly recording. Its recordings are constantly being modified in the light of fresh experience, and comprise, amongst other things, a complete knowledge of all the fundamental facts of biology and social relationships, as well as the pattern of so-called instinctive behaviour. The more vivid of these are what Jung called the archetypes. In addition, each mind has its own special experiences, just as each of the molecules of water in a cloud must have.

Before a mind enters a body I picture it as being in touch with all its previous recordings. Once the mind has entered a body and the brain has become functional, then it can work only through the medium of the brain and has to accept its limitations.

Our sense organs form the camera which records impressions from the outside world. These "pictures" are immediately developed by the brain into a form which the mind can appreciate.

From the active point of view the brain translates the behests of the mind into a form which can be appreciated and acted upon by the body. These behests may be framed at a level below consciousness, in close co-operation with the various unconscious compartments. The resulting behaviour may thus be "complex-determined," and not apparently in accord with reality.

When we remember anything, what in effect we do is to run the film rapidly backwards until a certain frame is before us. Under ordinary circumstances our mind can thus recall only frames which were once processed by the brain, and not all of those, since some scenes will have been cut out by the censor and relegated to the personal unconscious. These may be recovered by various techniques—free association, abreaction under certain drugs, and of, course, hypnosis. It seems though that the hypnotic state somehow also enables the mind to recall and appreciate recordings which never were processed by the brain; recordings which were made before there was a functional brain.

Assuming that there is an element of truth in this conception, and that the mind has this hitherto unsuspected power, the gate would seem to be open to a wealth of knowledge and understanding from the realm of what at present is merely speculation. I believe that the gate is open.

I foresee, to begin with, a theory of psycho-dynamics based upon the psychical life of the foetus. This would not necessarily be purely psychological. I would not discount the possibility that the prevailing mood of the mother might be reflected in her own biochemistry and thus influence the mood of the foetus.

I believe I have evidence of some form of telepathic communication between mother and foetus. I suspect though that the most important basic factor will be a more precise knowledge of the archetypes. This I think would probably emphasize the fact that the infantile situations which lead to such things as the Oedipus and castration complexes are quite inevitable, but increasing knowledge of the mental hygiene of the pregnant woman, the foetus, and the new-born child might enable us considerably to modify their severity.

Such a system of psycho-dynamics would, I think, be very simple because it would be very logical. I think it would underlie and embrace elements of all the main schools of to-day. That each school can claim its successes but yet must admit its failures indicates, I think, that each school has some aspects of its doctrine which are true at some level by all standards; and it is only when these doctrines are applicable to the case in question that the result is successful.

Such a theory, based on what I believe some of the archetypes to be, has been formulating itself in my mind for some months. I believe it will be established that conception represents the first symbolical sexual intercourse and sometimes constitutes the primal psychic trauma. I am sure that it will be accepted that intra-uterine experiences and the ordeal of birth leave a very deep mark upon the psyche. I am equally certain that a patient can be helped to adjust to these experiences.

Looking further ahead, though confining ourselves to the limited field of psychiatry and not venturing further into philosophical speculation, I think it is possible that we may learn how to modify the patient's essential psychological constitution.

At present the path to all this appears to lie through hypnosis. I know that this procedure is not universally accepted, and that many workers hold that the technique of hypnoanalysis is fundamentally unsound. I fear that I cannot pursue that point here, but I hope to do so elsewhere.

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I should like to express my gratitude to all my colleagues who have always, been willing to discuss my ideas at length, and have offered much helpful advice.

To Dr. Atkin I am especially grateful. His very wide knowledge of the literature has always been at my disposal. He has combined very constructive and pertinent criticism with great encouragement, and has given me much help in the actual preparation of the paper.

RORSCHACH VALIDATION. II: THE VALIDITY OF COLOUR SHOCK IN THE DIAGNOSIS OF NEUROTICISM.

By J. D. KEEHN.*

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HAVING stated the case for the atomistic approach to Rorschach validation (Keehn, 21), we must now turn to an examination of the methods and results of the application of the approach to a single Rorschach sign.

Of all the various signs obtainable from a Rorschach protocol, one of the most important and most widely discussed is that of the reaction to colour. That Rorschach himself considered it to be of major importance, and to a certain degree separable, can be seen from the following remark (35):

"In view of the extraordinary variability of the experimental records there can be no fixed point from which factor a good and easy start can be made. In general, however, the surest start is that of the color answers which . . . as has been demonstrated in a purely empirical manner . . . represent the 'affectivity'."

This alleged relationship between Rorschach colour responses and 'affectivity' is said to be demonstrated both overtly and covertly. Firstly, upon subtle inquiry the patient may admit to having been influenced by coloured portions in the blot in determining his response. According to whether the response is determined purely by the colour alone, by colour modified by form or by form supplemented by colour, so it is supposed to indicate the degree of emotional control; the more prevalent the colour the less complete the control. This, of course, is not considered in isolation, but balanced by other factors such as the amount of human movement responses given, but by and large a general parallelism between overt colour response and control of emotionality is hypothesized.

This parallelism is not, moreover, confined only to those responses in which colour is admittedly used as a determinant, but is further extended to cases where no such admission is made. Thus it is posited by Rorschach that in certain cases reaction to colour is repressed, and that such repression can be recognized by particular behavioural signs. This repression of colour he correlated with repression of emotion. To quote Rorschach's own words:

"Some subjects experience an unmistakable shock, an emotional and associative stupor of varying length, when the coloured Plate VIII appears after the preceding black ones. These subjects suddenly become helpless though previously they had been interpreting well. They find the coloured plates more difficult to interpret than the black plates, and they react with astonishment or vexation. Such subjects are always 'emotion repressors,' neurotics of varying degrees of severity" (34, p. 35).

Whereas the overt, direct responses to colour, C, CF and FC are, in conjunction with M, used to establish a typology of extratensiveness-introversiveness in the so-called normal personality—with the qualification that the pure colour response seldom occurs in such a personality—the indirect colour reaction, or colour shock, is said by Rorschach to be most apparent only in neurotics. Being thus recommended as a useful clinical diagnostic tool, it has recently come in for rather more investigation than has the more direct colour response.

Before going on to consider the findings of some of the investigations into this concept it is well to get some of the difficulties clearly in mind. The main sequence of argument is this:

- (1) Colour on the cards is reacted to indirectly by certain persons.
- (2) This reaction results in certain observable behavioural acts.
- (3) Such persons are of a neurotic nature.

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TABLE I.—*Synopsis of Major Indices of Colour Shock put forward by Various Workers.*

Criterion of shock.	Rorschach.	Loosli-Usteri.	Beck.	Klopfer.	Brosin and Fromm.	Meyer.	Bochner and Halpern.	Lazarus.	Rapaport.	Miale and H-Erickson.	Allen, Manne and Stiff.
1. Long R/T to Card VIII	*	:	:	:	:	:	:	:	:	:	:
2. Emotional reaction or comments	*	*	..	*	*	*	*	..	..	*	*
3. First colour response eccentric	..	*	..	..	..	..	..	..	..	..	..
4. Only pale colour interpreted	..	*	..	..	..	..	..	..	..	..	..
5. Colour answers to II and III not to VIII, IX and X	..	*	..	..	..	..	..	..	..	..	..
6. VIII, IX, X per cent. less than about 33	..	*	*	*	*	*	..	*	..	..	*
7. Longer average R/T to colour than to other cards	..	..	*	*	..	..	..	..	..	..	*
8. Reduction of responses on II, III, VIII, IX and X	*	..	*	..	..	..	..	*	..	..	..
9. Rejection of colour card	..	..	*	*	*	*	*	*	*	*	*
10. Decline in form quality	..	..	*	*	*	*	..	*	..	*	*
11. Decrease in Z	..	..	*	..	..	*	..	*	..	..	..
12. Decrease or delay in populars	..	..	*	*	*	*	..	*	..	..	*
13. Sequence upset	..	..	*	*	*	*	*	*	..	..	..
14. Regression in colour responses	..	..	*	..	..	..	..	*	..	..	..
15. M responses shift to autistic	..	..	*	..	..	*	..	*	..	..	..
16. Increased A per cent.	..	..	*	..	..	*	..	*	..	..	..
17. More anat. responses on C cards	..	..	*	..	..	*	..	*	..	..	..
18. Appearance of oligophrenic details	..	..	*	..	..	..	..	*	..	..	..
19. Long R/T on any C card	..	..	..	*	*	..	*	..	*	*	..
20. Greater banality of F responses	..	..	..	*	*	*	..	..	..	..	*
21. Any irrelevant comments to C cards	..	..	..	..	..	..	*	..	..	..	..
22. Numerous C and CF responses	..	..	..	..	..	..	*	..	..	..	..
23. Excessive turning of cards	..	..	..	..	..	..	*	..	..	..	*
24. Reduced productivity or rejection of Card IX	..	..	..	..	..	..	..	..	*	..	..
25. Few responses to C cards	..	..	..	..	..	..	..	..	..	..	*
26. Decline in W's on C cards	..	..	..	..	..	..	..	..	..	..	*
27. Decline in D's on C cards	..	..	..	..	..	..	..	..	..	..	*
28. Very short R/T on II, III, VIII, IX and X	..	..	..	..	..	..	..	..	..	..	*

Even in this long and diverse list some attempt has been made at abbreviation by regarding statements which resemble each other as identical, despite ambiguity and implicit differences. In this way a certain amount of specificity has been sacrificed, but on the whole it should be evident that many of these signs depend upon quite subjective interpretations, and so themselves are dependent upon yet other indices.

All three of these points have been subjected to various experimental investigations, but owing to the failure to treat each hypothesis separately, a good deal of confusion and contradictory evidence has arisen.

Firstly, point (3) involves a whole theory of neurosis. Rorschach evidently regards the neurotic as an "emotion repressor"; others may not. Psychologists and psychiatrists are fast becoming notorious for their failure to agree on what constitutes a neurosis (although current researches by Eysenck (15, 16) and his co-workers seem to show some progress in this direction), so that any large measure of agreement in diagnosis by independent workers is hardly to be expected yet. Thus contradictory results could be obtained because different types of persons were being called by the same name, so that Rorschach's neurotic may show colour-shock whilst Loosli-Usteri's do not, because they both have different views as to what constitutes a neurosis. Thus Rorschach's statement that "Such subjects are always . . . neurotics," and Hertz's (19) report that Loosli-Usteri found signs of colour shock in 61 per cent. of a normal group of one hundred successful business men could be reconciled if Loosli-Usteri were found to be much more cautious about making a diagnosis of neuroticism than was Rorschach.

But this is not all. Considering point (2) above, we can see from Rorschach's quoted statement that he had certain definite ideas as to which behavioural acts to expect. He stated, in other words, the criteria for recognizing colour shock. That the dramatic nature of such criteria is not so definite and unambiguous as Rorschach would lead us to expect can be seen by reference to the number of subsequent studies which have been attempted to give sure signs by which colour shock may be recognized. These signs are summarized in Table I.

In Hertz's short report of Loosli-Usteri's study no such criteria of colour shock are given. In another publication (26) where such criteria are given, not only do we find more inclusive criteria than those suggested by Rorschach, but also a distinction between such shock to Cards II and III and between shock to Cards VIII, IX and X. Rorschach makes it perfectly clear that shock only occurs on Card VIII.

Not only, then, may the two workers (and I am only using these as specific examples) be using entirely different groups of subjects, but they may also be using different criteria to designate the same phenomenon. It may be argued, of course, that this is partly an exaggeration, and that the actual situation is not nearly as bad as it can be made to appear on paper. This may be true although there is no evidence to support it, but the fact remains that in all the studies used to "validate" colour shock, different populations have been used and different criteria have been put forward as evidence or signs of colour shock. Small wonder, then, that little agreement has been reached either on the relevant and fruitful criteria to be employed or on the ability of such criteria to differentiate between certain clinical groups.

Really the studies listed below as attempts at validation of colour shock are more properly concerned with modification and specification. In no instances are Rorschach's own criteria interpreted and employed explicitly, but always certain modifications and additions are made. This is quite proper so long as we remember that we are investigating certain criteria of, and not an abstract concept of, colour shock.

For experimental investigation Rorschach's own statements are not so definite as might be hoped. How, for instance, is one to set the limits of an "emotional and associative stupor of varying length"? And certainly the author has never met anything that he would call a stupor, nor anyone who has become "helpless, though previously . . . interpreting well" in his experience with this test. How, again, are we to determine that the patient is finding the coloured plates more difficult to interpret, and how can we be sure of recognizing astonishment or vexation from the patient's expression?

With these problems in mind, then, it is reasonable that different observers should have set up their own more definite and objective criteria of colour shock, as set out in Table I, and set about testing the validity of such new criteria. Providing we remember that such criteria are not duplicated absolutely from study to study we shall not fall into the error of comparing and evaluating results from studies which are, strictly speaking, in no way comparable.

The study by Miale and Harrower-Erickson (28) goes some way towards overcoming the difficulties discussed above. Not only do they clearly state their view of neuroticism, but they also specify fairly definitely their criteria of colour shock.

As a definition of neurosis they offer a modified version of the definition by O. Spurgeon English that—

"A neurosis is a clinical condition in which the manifestations may be symptoms of physical dysfunction, recurring thoughts, acts or effects which serve no useful purpose, but which nevertheless cannot be modified by the subject, and in which the manifestations are accompanied by a subtle but definite disturbance of the integration of personality and in the ability to adapt to reality."

For their criteria of colour shock they list four signs which may be summarized as—

- (a) Long R/T before first response on colour card.
- (b) Exclamations indicating arousal of new emotions.
- (c) Decline in quality of form responses.
- (d) Rejection of the card.

Of these, it will be seen, only the second is taken direct from Rorschach, and while the first and last are merely extensions of Rorschach's remarks about Card VIII to all the coloured cards, the last criterion seems to be quite original. Using, apparently, the appearance of any one of these signs to indicate colour shock, Miale and Harrower-Erickson claimed to have found such shock in 98 per cent. of a group of 43 neurotics, whilst only 20 per cent. of a group of 20 normals exhibited it.

This figure of 20 for the percentage of normals showing colour shock is also proposed by Klopfer and Kelley (22), who regard colour shock as a major index in the diagnosis of neurosis as is indicated by their statement that—

"Probably the most important single sign of a neurotic reaction is colour shock; all students of the method have found that neurotics invariably show such shock, and only a small percentage of normals and other types of psychopathy display it" (p. 385).

They also admit the presence of signs of colour shock in certain organic cases and dementia praecox. Bochner and Halpern (9), however, whilst agreeing that early schizophrenics may show signs of colour shock, certainly do not admit of its occurrence in the protocols of organics. As to the value of colour shock as an indicator of neurosis they state in a footnote (p. 140) that—

"Color shock as a neurotic indicator is a much over-rated symptom. Almost every subject shows some deviation in the form of his reaction when confronted with the color cards."

Using 21 ten to fifteen years old psychiatric cases at a summer camp, Young and Higginbotham (42) reached much the same conclusion; nearly all their subjects, whether suspected neurotics or not, exhibiting some of the Miale and Harrower-Erickson signs of shock. Until a unitary theory of neurosis develops and until a standard set of colour shock signs become recognized such divergences of opinion must remain, and no satisfactory solution can be offered.

Other, isolated, signs of colour shock have been put forward by various writers, notably Allen (1), Sanderson (36), and Wallen (41). Allen (1) advocates a comparison of the ratio

Total time for coloured cards
Total responses for these cards

with the corresponding ratio for the non-coloured cards to see if any impoverishment has occurred. He recommends this as a useful check on the more usual procedure of comparing the average reaction times to both groups of cards in order to obviate the spurious effect in the latter which may be determined by "intellectual" shock [Coyne (12)] to Card IX.

Sanderson (36), however, makes the point that comparison of means or totals is a dangerous procedure anyway, as any kind of specific reaction to any of the cards could contribute disproportionately to the result. He gives instead a set of norms obtained from protocols of 50 normal subjects setting the limits of the normal reaction time for each of the ten cards. Shock to any one of the cards could then be determined by comparison of the obtained reaction time with the norm. As an error occurred in the original printing of his table these norms are reproduced below with minor alterations and incorporating the subsequent correction. The bracketed

figures are similar norms obtained from 150 normal subjects tested by the author. The wide discrepancy between these two sets of figures serves not only to emphasize the dangers of such an approach, but also to lend support to Crown's (13) contention that widely different results can be obtained from different samples of so-called normal populations.

TABLE II.—*Norms for Reaction Times to the Rorschach Cards.*

Card.	(1) Mean R/T normals.		(2) Mean R/T neurotics.	(3) Approximate normal limits. (Seconds).
I . . .	7.76	(15.0)	. 12.7	. 5 to 11
II . . .	11.66	(25.1)	. 22.7	. 5 „ 18
III . . .	9.22	(16.5)	. 15.0	. 5 „ 14
IV . . .	13.02	(22.0)	. 18.5	. 8 „ 18
V . . .	9.66	(16.1)	. 19.6	. 4 „ 15
VI . . .	14.70	(33.1)	. 40.6	. 4 „ 25
VII . . .	14.26	(33.8)	. 37.8	. 7 „ 22
VIII . . .	11.46	(20.9)	. 26.2	. 4 „ 19
IX . . .	15.56	(34.8)	. 43.9	. 5 „ 27
X . . .	13.54	(28.5)	. 32.1	. 5 „ 22

The normal limits of initial reaction times to the various cards as obtained by Sanderson are shown in column (3). The figures are shown to the nearest second as the usual method of collecting such data would allow of no greater practical accuracy. Column (1) shows the mean R/T of Sanderson's subjects to each card; the bracketed figures are those collected by the author on a miscellaneous group of 150 normal soldiers and students. Despite the discrepancies between the individual card norms, possibly dependent upon cultural influences, the ratio of the reaction time to Card VIII to the mean reaction time to Cards I to VII is very nearly unity in both sets of figures. This ratio also holds for the group of 25 neurotics whose mean R/T's are shown in Column (2).

In this particular case a better procedure would seem to be to use each patient as his own control, and present, say, the distribution of the ratio of the reaction time to Card VIII to the mean of the reaction times to the first seven cards. That such a procedure may reconcile the two sets of figures is evinced by the fact that, assuming Sanderson used 50 cases for each of his means, the mean reaction times for Cards I to VII are 11.47 and 21.1 for each set of figures respectively. In each case this is very nearly equal to the mean reaction time to Card VIII. Thus we may tentatively conclude that the ratio of the reaction time to Card VIII to the mean reaction time to Cards I to VII is very nearly unity for normal subjects.

This ratio, when calculated for a mixed group of 25 diagnosed neurotic cases attending the Maudsley Hospital, also deviated insignificantly from unity, showing the sign not to be indicative of neuroticism. It may, however, be diagnostic for certain neurotic sub-groups, such as hysteria; but this point has not yet been tested.

As his criterion of colour shock Wallen (41) used expressed preference for chromatic or achromatic versions of the cards by normal and unstable subjects. His assumption was that colour shock would result in an expressed dislike of the card. The most relevant of his findings were that the coloured cards were most often preferred to their achromatic counterparts by the normals, but that unstable men showed more preference for the achromatic versions of three of the five "coloured cards."

Another form of attack on the colour shock question has been not to examine statements (2) and (3) above, but to question the first premise, namely that it is the colour on the cards which is responsible for the behavioural differences exhibited by some subjects to Cards II, III, VIII, IX and X. The first of such studies was a rather novel one by Brosin and Fromm (10). They examined the Rorschach protocols of twelve subjects of varying degrees of colour defect as indicated by the Ishihara, Stilling and Holmgren tests, and showing various types of clinical syndromes. Despite their colour defects the neurotic subjects in this rather small group still showed signs of colour shock, in such a way that the more clinically severe cases of neurosis exhibited the greatest amount of shock reaction. Rather than completely reject the idea of colour shock, Brosin and Fromm proposed three alternative hypotheses to account for their results, namely,

(1) That their subjects may have had sufficient colour vision for the purposes of the test.

(2) That the physical stimuli may have caused certain physiological consequences without awareness. Or—

(3) That the responses may have been due to shades of grey in the cards.

Certainly the concept of shock to colour cannot be rejected summarily on the evidence of this experiment, but at least the results have served to direct attention to its rather tenuous nature.

Following an idea from Baumgarten-Tramer (5), Rabin and Sanderson (30) tried reversing the order of presentation of the cards. Baumgarten-Tramer argued that the shock shown to the first coloured card could be explained in terms of perseveration and resistance to shift, and that consequently, if the order of the cards was reversed so that the coloured cards preceded rather than followed the non-coloured cards, similar signs of shock would still be exhibited in neurotic subjects. The explanation of the appearance of the signs of shock would then have to incorporate the concept of resistance to shift instead of, or perhaps in addition to, the presence or absence of colour.

In testing this hypothesis, Rabin and Sanderson used 34 normal subjects, half of whom were given a Rorschach in the usual manner and the other half of whom received the cards in the reverse order. However, Rabin and Sanderson found little difference in productivity or reaction time for the two groups, and so gave no support to the "resistance to shift" hypothesis, yet they did suggest that their results were consistent with the colour shock phenomenon being due to differential difficulties within the ten cards. Some cards they found to be objectively more difficult to interpret than others, and this could give rise to the indices alleged to depend upon the colour alone.

The point that colour may not be solely responsible for some of the responses attributed to it has also been made by Benjamin (8), who states that—

" . . . while some responses to the coloured plates may be identified with colour shock and associated with neurotics, colour *alone* may not be responsible for this . . . there may be other test factors such as the shading of the colour cards and their unique form."

To test the effect of removing colour from the cards, several writers have constructed parallel sets of cards to the normal Rorschach sets, but excluding colour from Cards II, III, VIII, IX and X. Usually this is done by using achromatic photographs of the originals. The standard procedure, as introduced by Lazarus (23), (24), consists of testing two groups of subjects, one with the achromatic cards and one with coloured photographs of the originals, and then re-testing each group after an interval of a few weeks on the other set of cards. In this way, using 100 adolescents as subjects, Lazarus concluded that presence or absence of colour made no major difference to the responses, and that colour shock signs occurred in protocols from both the chromatic and achromatic cards.

However, Lazarus, as did Sappenfield and Buker (37), who found that the percentage of the responses to the last three cards (8-9-10 per cent.) was unaltered by presence or absence of colour, used the Group method of administering the Rorschach, and it is highly doubtful if results from such a procedure can be generalized to include the more standard method of giving the test. To overcome this difficulty Perlman (29) repeated the Sappenfield and Buker study with standard Rorschach procedure on three rather small groups (N 18, 10 and 8) of students and a group of 34 mixed patients. Again no difference between the groups either on test or re-test of the means or distribution of the 8-9-10 per cent. was found, irrespective of whether the chromatic or achromatic cards were used.

Using this technique and individual administration, Dubrovner, Von Lackum and Jost (14) found that colour influenced neither the productivity nor the reaction times of a group of 30 student-nurses, and with a group of 21 male schizophrenics Buker and Williams (11) concluded that although the removal of colour did yield a significant decrease in reaction time, colour as a discrete variable did not materially influence the responses.

Despite the criticism by Siipola, Kuhns and Taylor (39) of the method of counter-balanced groups put forward as a result of their discovery that if the achromatic cards are presented first the memory carry-over is sufficient to mask any effect of

colour on re-test with the chromatic series, this method continues to be used. Allen, Manne and Stiff (3), using a carefully prepared set of achromatic cards supplied by Huber of Berne, the official Rorschach printers, individually tested a small group of 25 normal students with both these and the usual cards. Whereas the achromatic sets used by earlier workers differed from the chromatic ones with respect to light and shade effects as well as in colour, Allen, Manne and Stiff contended that their two sets of cards differed only in colour. As they used a test-re-test interval of six weeks, they might also have overcome the objection of Siipola, Kuhns and Taylor who used only a four-week interval in their study. Of the signs of colour shock examined by them, as listed in Table I, they found that in the cases which they examined, viz., 6, 7, 8, 9, 12, 20, 26 and 27, they could find no evidence of the influence of colour. They also found that the removal of colour had no effect on the total number of responses to all ten cards. Allen (2) subsequently reported that he could find no significant differences between the chromatic and achromatic cards with respect to reaction time as exhibited by 25 normal subjects. In fact, in seven of the cases he obtained values greater than 1.5 for the ratio of the Mean RT to Cards II, III, VIII, IX and X to the Mean RT to Cards I, IV, V, VI and VII (Beck's criteria of colour shock) on the achromatic cards. In both these latter studies the authors have been careful to note that they have not disproved the hypothesis that colour has some influence on the interpretations made to the plates, but only that such influence is not usually found in normals. It still remains to be shown that similar results will obtain for neurotic subjects, although Buker and Williams's (11) study suggests that it is so for schizophrenics. Allen, Manne and Stiff (4) have also, again using only a small group of 25 normal subjects, demonstrated that the absence of colour from the usually coloured cards does not affect the consistency of responses to them, meaning by a consistent response one where the re-test was similar in both location and card orientation as well as descriptive content, to the one given on the original test. Not only does a study by Meyer (27) support the earlier view of the almost universal reaction of shock in response to colour, but it also shows that such reaction occurs just as frequently with an achromatic series of cards as it does with the normal ones. In a straightforward comparison of two groups each of 30 students he showed that 24 gave more than 2 of Beck's signs of shock with the standard cards, as did 25 of the group given the achromatic series.

The experimental evidence, then, seems to offer little or no support either for the continued use of colour shock in the diagnosis of neuroticism, or for the supposition that the signs of such shock are due to the presence of colour. However, if we revert to the original hypothesis that the colour causes an emotional disturbance, without necessarily equating this disturbance with neuroticism, and at the same time replace the concept of colour shock by the behavioural response of delay of reaction, some support will be found in the investigation of Siipola (38). Instead of using the whole Rorschach cards, she cut parts from them, both coloured and uncoloured. To one group of student subjects she gave the coloured pieces and to another group she gave the uncoloured ones and compared their reaction times and initial responses. She, like Buker and Williams (11), found the reaction times significantly longer to the coloured pieces, and concluded that this was a normal and not a deviant sign. She further posited that were this delay due to colour alone the recurrence of a particular hue from blot to blot would result in a correspondence between this and the reaction times to those blots. Her results, however, showed this not to be so.

By asking her subjects to rate each of the blots as pleasant, unpleasant or neutral, she found that more of the coloured ones were rated as pleasant or unpleasant and more of the uncoloured ones were rated as neutral. Thus a correlation, though not necessarily a causal one, between increased reaction time and emotional blockage is indicated. Noticing that when the colour and form of the blot were harmonious the reaction time was decreased, and that when each suggested a different interpretation an increase in reaction time occurred, Siipola posited a conflict on the part of the subject as the determining factor in this latter case. In this way she criticized the normal F, FC, CF and C Rorschach interpretations by regarding them simply as signs of the individual's resolution of such conflicts.

If it is to be maintained that delayed reaction to colour is indicative of neuroticism, very indirect evidence against conflict being the full explanation is available

from Thurstone (40) and Eysenck (15), where the former shows no correlation between a speed of decision test and one of dark adaptation, whilst the latter finds dark adaptation to be a good index of neuroticism. One might suppose, then, an absence of correlation between neuroticism and speed of decision. However, this only suggests that delayed reaction to Card VIII would not be an index of neuroticism if Siipola's hypothesis were correct, and as Siipola believes in the universality of delay in reacting to colour there is no conflict here. It is possible for the sign to be non-diagnostic but still occur via the mechanism that she postulates. Evidence from an experiment carried out by the author but not designed to test this particular point may be relevant. One hundred normal subjects were given a choice reaction type test whereby they had to press one key when the stimulus was a triangle and another when the stimulus figure was coloured blue. Ten trials were given, half with triangles and half with blue stimulus figures presented in random order, before a blue triangle appeared as stimulus on the eleventh exposure. All subjects pressed one or other of the keys to this figure, and only a few mentioned afterwards that they should have pressed both. This situation can be thought of as analogous to the Rorschach situation, where a series of grey cards is presented and their formal aspects reacted to, followed by a coloured card which can be interpreted either by colour or form. If, as according to Siipola, the delayed reaction to Card VIII is due to the conflict between separate tendencies to react to colour and form, a correlation between the amount of this delay and a similar delay to the last exposure in the choice reaction time test might be expected. The correlation of the difference between the reaction time to Card VIII and the mean reaction time to Cards I to VII and the difference between the reaction time to the blue triangle and the mean of the previous ten reaction times was, however, found to be only .1. If the two situations do have the suggested features in common, then Siipola's explanation must be regarded as incomplete, but it may well be that the low correlation arises because the tests are, in fact, really quite unlike. Further evidence specific to this question is required.

Other attempts at linking the signs of colour shock with emotional reactions have been made using known physiological correlates of emotional disturbance as external criteria of such reaction to the cards. In one such study, Rockwell *et al.* (32) took a continuous graphic recording of the palmar skin resistance of their subjects during administration of the Rorschach. Deploring the disregard of precision and recognition of colour shock introduced by workers subsequent to Rorschach, they reverted to the use of Rorschach's original indices. By also interpreting Rorschach as meaning by shock "the neurophysiological condition called 'shock,' which is defined as 'a sudden depression of the nervous system' or 'a condition of lowered excitability'," they justified their procedure of looking for concomitant variations between the psychological signs of shock as indicated by the Rorschach and the neurophysiological signs of shock as shown by changes in palmar skin resistance. They used 30 subjects, 20 normal and 10 neurotic, with the rather unorthodox Rorschach procedure of presenting the plates on a screen in a darkened room for only 90 seconds each, with the subjects encumbered by the various electrical recording devices for measuring the PGR. They equated indices of shock and instability apparently quite subjectively, by saying that ten of their normal group (group A) "showed no color shock, and who, clinically, appeared to be relaxed and, in general, emotionally stable," whilst the other ten (group B) "showed clear-cut evidence of color shock, and who, clinically, appeared to be more tense and, in general, emotionally less stable. . . ." All their neurotics (group C), they claimed, showed definite signs of colour shock.

Apart from this correlation between shock indices and overt emotionality, they also looked for a relationship between the indices and disturbance as measured by the PGR. On Card VIII they did find a significant decline in the PGR reaction from group B, as compared with group A, but no such decline was found in the neurotic group, due, according to the authors, to a general inhibition of the PGR response of this group throughout the ten cards. Although their results are consistent, then, within the normal groups in showing the co-variation of instability, appearance of Rorschach's indices of colour shock and changes in PGR recordings to Card VIII, they show no such correlation with the neurotic subjects. Goodman (17), using a similar technique but with standard Rorschach administration on 23 normal and 27 neurotic subjects, reported that—

"Within the limits of this experiment the assumption that color on the Rorschach is an emotional stimulus and is reacted to as such is not valid."

In his very brief report he states that no one card consistently had more affective value than the others, but that the relative affective values of the cards varied from subject to subject and that neither colour shock nor colour productivity were related to this affective value.

Similarly, Levy (25) postulated that a change in palmar skin resistance would accompany affective experiences to the cards, although she preferred to measure conductance rather than its reciprocal, resistance. Even more liberties were taken with the Rorschach administration in this experiment than heretofore. To eliminate position effects the cards were presented in serial order, the subjects were restricted to one response per card and the cards were presented by machine to prevent the subjects from handling them. No significant differences in affective values of the cards were found, though Card VIII did show a tendency to rate highest. This failure to corroborate Rorschach hypotheses with physiological criteria was confirmed by Hughes, Epstein and Jost (20), using such measures as respiration, heart rate and blood-pressure as well as the PGR.

Rockwell *et al.* (33), emphasizing that in their previous study "evidence was presented in favor of the hypothesis that inhibition of associations during color shock is accompanied by an inhibition of autonomic responsiveness as measured by the skin resistance method," determined to examine the effect with the colour removed from the cards. They constructed a parallel achromatic set by the usual photographic method, but reported no special precautions taken to equalize the other effects inevitably introduced by such a technique, and presented the cards in the same manner as in their previous study (32). Finding, as had Siipola, Kuhns and Taylor (39), a pronounced memory effect when the grey cards were presented prior to the coloured ones, they dispensed with the method of counter-balanced groups and gave all their subjects the coloured series first. On re-test a week later their achromatic version was given to both their groups of subjects, the first comprising 15 students who gave no signs of colour shock on the initial test, and the second rather smaller group of 8 students who had shown such shock. Their findings did enable them to put forward some interesting hypotheses about their subjects' approaches to the test, but no evidence to show that removal of the colour had any significant effect on the appearance of psychological or physiological shock emerged. Thus confirmation of the lack of correlation between colour and emotional disturbance as found by the other physiological experiments is offered.

Reducing this confused mass of data to order presents a difficult, though not impossible, task, for so inconclusive are most of the results that many contradictions may be attributable to experimental error. With this in mind certain general trends can be detected.

From the studies by Meyer (27), Loosli-Usteri (19) and Young and Higginbottom (42) and the opinions of Bochner and Halpern (9) it seems that most of the signs of shock listed in Table I are not restricted to the protocols of neurotic subjects, and so cannot be diagnostic. Even though the criticism has already been made of the lack of specificity by various writers of the meaning of neuroticism, there is probably sufficient agreement in general to justify this conclusion. The further evidence from numerous studies that similar reactions occur with or without colour on the usually coloured cards suggests that the appearance of shock is due to some other variable. It is a pity that nearly all of these studies have been restricted to the use of student and other normal groups as subjects, for without the doubtful evidence demonstrating that signs of colour shock appear in most protocols, this absence of differential reaction to the coloured cards by normals would be expected. The point could be clinched by showing that diagnosed neurotic subjects exhibited signs of colour shock even in the absence of colour. This tendency on the part of American psychologists to concentrate their researches upon student populations when studying personality variables is as lamentable as is the recent limitation of their comparative counterparts to experiments on the albino rat (Beach, 6).

Bearing in mind the seeming irrelevance of colour, the contention of Siipola (38) relating delay to conflict between interpreting according to colour or form seems unwarranted, the more probable explanation being in terms of difficulty of interpretation. This view is supported by Benjamin (8), Rabin and Sanderson (30) and the norms presented by Sanderson (36) and the author, each showing Card IX to

have the longest reaction time of all the cards. Following, as it does, two difficult cards, VI and VII, and an easier one, VIII, it is evident why some writers have tended to stress its importance in the elicitation of colour shock, although their explanation in terms of a carry-over effect from shock to Card VIII is unsubstantiated.

The fact that colour shock is not due to colour need be no cause for dismay, for as is amply demonstrated by Granger (18), there are many unexplained perceptual phenomena showing individual differences which may link up with temperament. By eliminating the abstract concept of colour shock and substituting instead the various indices which do show individual differences on the Rorschach we may yet find some which also correlate with personality variables.

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A METHOD OF SCORING THE T.A.T. APPLIED TO PSYCHONEUROTICS.*

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INTRODUCTION.

"THE T.A.T. draws forth no more than twenty small samples of the subject's thought. To suppose these will invariably provide a skeleton of total personality is unduly optimistic" (6). With this warning no experienced clinical psychologist is likely to disagree. The present aim has been to provide a method of analysing and quantifying the content of the responses which minimizes dependence on hypotheses derived from outside the test situation and to relate the results to the amount produced and, more particularly, to the rate of production.

Ten pictures only were used throughout, these were: for men, 1, 2, 3BM, 4, 5, 6BM, 7BM, 8BM, 12M and 13MF, and for women, 1, 2, 3GF, 4, 5, 6GF, 7GF, 8GF, 9GF, and 13MF.

The instructions followed those of Rapaport (7) and included the four questions: (i) What is the situation? (ii) What might have led up to the situation? (iii) What might the people be thinking or feeling about the situation? (iv) What might the outcome of the situation be?

The investigator recorded the stories in shorthand, sitting at an angle of about forty-five degrees behind the subject. Lack of skill in this operation resulted in an artificial ceiling at fifty to sixty words per minute, since this, of course, included bursts of much higher speeds; 7 per cent. of subjects hit this ceiling and had to be requested to speak more slowly. No reactive depressives or obsessionals came anywhere near this limit.

After pauses of approximately thirty seconds the appropriate one of the four standard questions, "What is the situation?", etc., was interjected. The only other questions employed were for clarification, such as "She has lost someone near to her" . . . "Whom has she lost?"

Despite these limitations on quantitative accuracy, previous experience with the test had suggested that four measurements were of great value: starting time, total words, total time and words per minute. The starting time represents the number of seconds elapsing between the presentation of the picture and the beginning of the story.

The allocating of T.A.T. responses to various categories is not, as Valentine and Robin first assumed (15), an objective procedure. Such classification cannot even be assumed to be a subjective procedure of high reliability. If in one experiment with the T.A.T. classifiers A and B start with *carte blanche*, the likelihood of obtaining a high reliability coefficient is slender. The different methods of analysis advocated, for example, by Rotter (10), Murray (6), Rapaport (7), Tomkins (14), Shorr (11), Aron (1), Rosenzweig (9), Symonds (13) and Valentine and Robin (15) bear witness to this.

If A presents a series of categories to B with the injunction to fit the responses to them, the chances of obtaining satisfactory agreement will be greatly increased. This method has its own serious limitations. In a second experiment the optimal chance of obtaining agreement could only result from an acceptance by C of A's original classificatory scheme and so on through D, E, F, etc., thus setting up a dictatorship of A and decreasing the likelihood of the classification being an adequate representation of the basic data. Standardization of the T.A.T. in a manner acceptable to the majority of psychologists using the tests is a distant, if not indeed unattainable goal.

The dictatorship of A (the present writer) method was used. The justification for the choice was more than four years regular experience with the test, during which time some four hundred protocols had been obtained from a wide variety

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of mental patients. The protocols used in the present study were submitted to three judges for classification into the given categories. The three judges were respectively a final year psychology student, an experienced occupational therapist and a typist. If a consistent method of analysis could thus be found, however partial, this would serve as a check on more intuitive clinical appraisals and would make possible the comparison of results obtained before and after treatment, leading perhaps to prediction from the pre-treatment results of the outcome of treatment. From this type of data might emerge hypotheses which could later be subjected to more rigorous experimental procedures. Pictures could perhaps be designed and a rather more controlled technique employed to elucidate specific problems.

PRODUCTIVITY AND FLUENCY.

Rosenzweig (9) published norms for 50 men aged 27.5 years (S.D. 6.0) and 50 women aged 27.5 (S.D. 6.3) for all but the words per minute category. Pictures 5, 6GF, 8GF and 12M were not, however, used. The general means (for all pictures and both sexes) he gives as follows: reaction time 20 seconds (range 14-29); total time 3.7 minutes (range 2.8-4.7); total words 143 (range 114-181).

Rosenzweig's sample cannot, of course, be regarded as an adequate control group of normal subjects for this study, but a comparison is of some interest.

Table I gives the mean for starting times (Rosenzweig's reaction times) for the five psychoneurotic groups in the present study. It also includes the number of subjects in each group (N), Age, Progressive Matrices (P.M.), and Mill Hill Vocabulary (M.H.V.) scores.

TABLE I.—*Starting Times of Psychoneurotic Groups.*

Diagnostic group.	N.	Age.	P.M.	M.H.V.	S.T. time.	
					M.	S.D.
Psychopaths . . .	36	30.7	40.0	50.7	15.11	10.26
Hysterics . . .	44	34.1	38.4	53.6	19.00	18.85
Anxiety states . .	39	35.8	39.9	50.8	26.56	21.86
Depressives . . .	27	38.7	37.2	53.5	28.70	22.53
Obsessionals . . .	14	38.7	43.4	56.5	26.21	19.35

For the diagnosis, on which the groups are based, the final opinion of the psychiatrist was accepted. In a closed working community it is not feasible entirely to eliminate the influence on the psychiatrist of the psychologist's opinion derived from the test. In some of the minority of cases in which these opinions differed the psychologist's opinion prevailed; in others the psychologist had reluctantly to place the protocol in a group in which it appeared atypical. While it may, in the future, be more fruitful for psychologists to work exclusively with test diagnoses rather than psychiatric diagnoses, I feel that, at the present time, enthusiastic clinical psychologists who seek to sweep away the accumulated experience of psychiatrists may find themselves in the position of Mark Twain who, at the age of 14, thought his father unbelievably ignorant and was astonished, at the age of 19, to discover how much the old man had learned in five short years.

The differences between psychopaths and anxiety states and psychopaths and depressives are significant at the 1 per cent. level of confidence (C.R. 2.94 and 2.92). The difference between psychopaths and obsessionals is significant at the 5 per cent. level (C.R. 2.04).

Table II gives the means for total words (productivity) for the same groups.

TABLE II.—*Productivity of Psychoneurotic Groups.*

Groups.	Total words.	
	M.	S.D.
Psychopaths . . .	1368.61	617.13
Hysterics . . .	1614.20	720.04
Anxiety states . .	1154.23	450.81
Depressives . . .	924.44	360.54
Obsessionals . . .	1303.93	550.29

Three differences are significant at the 1 per cent. level of confidence: hysterics and depressives (C.R. 5.35); hysterics and anxiety states (C.R. 3.53) and psycho-

paths and depressives (C.R. 3.58). Two differences are significant at the 5 per cent. level: depressives and obsessionals (C.R. 2.33) and anxiety states and depressives (C.R. 2.29).

Table III gives the mean total time spent on the test by each group.

TABLE III.—*Time Taken on Test by Psychoneurotic Groups.*

Groups.	Total time.	
	M.	S.D.
Psychopaths . . .	37.78	13.32
Hysterics . . .	46.68	23.16
Anxiety states . . .	43.74	22.13
Depressives . . .	41.30	14.96
Obsessionals . . .	42.57	13.23

Only one difference was significant even at the 5 per cent. level: hysterics and psychopaths (C.R. 2.19).

Table IV gives the mean words per minute for each group.

TABLE IV.—*Fluency of Psychoneurotic Groups.*

Groups.	Words per minute.	
	M.	S.D.
Psychopaths . . .	37.06	11.34
Hysterics . . .	36.45	9.28
Anxiety states . . .	30.41	12.49
Depressives . . .	23.22	6.45
Obsessionals . . .	30.29	7.59

Two differences are significant beyond the .1 per cent. level of confidence: hysterics and depressives (C.R. 7.07) and psychopaths and depressives (C.R. 6.18). Two are significant at the 1 per cent. level: anxiety states and depressives (C.R. 3.06) and depressives and obsessionals (C.R. 2.97). Four differences are significant at the 2 per cent. level: hysterics and obsessionals; hysterics and anxiety states; psychopaths and obsessionals, psychopaths and anxiety states. The respective C.R.'s are: 2.50, 2.48, 2.45 and 2.44. Only, therefore, between psychopaths and hysterics on the one hand and anxiety states and obsessionals on the other did fluency fail to differentiate.

Only one of the twenty differences between the means for men and women was significant even at the 5 per cent. level of confidence, male anxiety states being more fluent than female (C.R. 2.49—21 females and 18 males). The sexes were, therefore, combined for consideration of the sub-groups.

TABLE V.—*Productivity, Fluency, etc., of 40 Male, 40 Female Dysthymics and Non-dysthymics.*

	Non-dysthymics.		Dysthymics.	
	Male.	Female.	Male.	Female.
Starting time:				
Mean . . .	18.00	16.60	27.35	27.10
S.D. . . .	18.39	11.20	19.71	15.03
Productivity:				
Mean . . .	1483.00	1524.50	1227.37	978.37
S.D. . . .	704.44	609.76	523.44	357.87
Total time:				
Mean . . .	40.47	45.07	42.57	42.87
S.D. . . .	19.62	19.83	20.18	16.87
Fluency:				
Mean . . .	38.02	35.42	30.77	25.15
S.D. . . .	11.20	9.22	10.38	9.79

For the broader groupings of dysthymic and non-dysthymic the sexes have been kept separate. Table V shows the means and standard deviations for 40 male and 40 female patients in each of the groups.

There are no significant differences in the total time category. Dysthymic men were significantly more fluent than dysthymic women (C.R. 2.49). Apart from this there were no sex differences. The three remaining categories all showed differences between the two female groups at the .1 per cent. level of confidence—starting time, C.R. 3.55; productivity, C.R. 4.89; fluency, C.R. 4.87. The corresponding figures for men were: 2.19 (5 per cent. level); 1.84 (not significant); 3.01 (1 per cent. level).

The correlations of age with fluency on the T.A.T. and of Progressive Matrices score and fluency were both below 0.1; but fluency and vocabulary score correlated 0.30. Examination of the mean vocabulary scores of the five sub-groups makes it clear that the differences in fluency cannot be explained in terms of vocabulary level.

The characteristic pattern with respect to the four quantitative categories for each group relative to the remainder may be described thus:

Psychopaths begin their stories very quickly, produce a moderate amount, spend a short time on the test, but talk very rapidly.

The speed of psychopaths may be due, in part, to the fact that either their conflicts are more deeply repressed or, as many psychiatrists believe, that they do not exist intrapsychically. In either case there is likely to be relatively little division of attention.

The fact that these subjects spend a shorter time on the test than hysterics may reflect a lesser degree of ego-involvement in the stories, which is perhaps borne out by the content analysis. They are more concerned with displaying their virtuosity as story-tellers than with revealing themselves vicariously in the stories. In addition, resistance is more often met with in this group, ranging from truculence to facetiousness.

Hysterics tend to start their stories quickly, though the variability is greater than in other groups. This is attributable to the fact that a minority of subjects spent a long time preparing "literary" stories before actually beginning to speak. They produce long stories and talk rapidly for a long time. They often enjoy the situation. When they say so, there is little doubt about the diagnosis.

Anxiety states, relative to psychopaths and hysterics, start slowly, produce less than any but reactive depressives, talk at a moderate speed for a moderate time. They are more variable in the two latter respects than the other groups. With regard to fluency, the greater variability is due to the sex difference mentioned above.

Reactive depressives start slowly, produce very brief stories in a moderate time and produce them very slowly.

Obsessionals start slowly, produce stories of moderate length in a moderate time at a moderate speed.

Marked deviations on any particular picture from the subject's own mean for all pictures often aided the clinical analysis of the stories.

CONTENT ANALYSIS.

(i) *The method*.—For reasons of space the analysis is confined principally to the female subjects and to pictures 3GF, 6GF, 9GF and 13MF.

The method of analysing the data is somewhat similar to that originally employed by Kent and Rosanoff (5) with the Word Association Test in that responses are recorded on a frequency table. Owing to the almost unlimited number of minor variations in the responses on the T.A.T. it was, however, necessary to group together similar responses. This method has been applied to the T.A.T. by Rosenzweig (9) and by Valentine and Robin (15). The elaborations of this type of method discussed by Raven (8) and applied by Foulds (3) to the Controlled Projection Test have now been further developed.

Stories were analysed in terms of the four questions "What is the situation?" etc. A fifth section was added in the case of some pictures for particular comments on the appearance of the people or objects in the picture.

When alternative stories were given an attempt was made to get the subject to select one of the two; where they could not do so, the dominant one only was

classified. If a response occurred in fewer than 10 per cent. of the records of all four groups it was entered under "Sundry." It is here, of course, that much of the most personal and clinically significant material is to be found.

All three judges agreed in their classification of 67 per cent. of items, two out of three agreed in 29 per cent. A fourth judge was called in for the 4 per cent. in which there was no agreement.

(ii) *Results*.—Table VI gives the frequency of classified responses for 40 female dysthymics and 40 female non-dysthymics (hysterics).

TABLE VI.—*Responses of Dysthymic and Non-dysthymic Women to Picture 3GF.*

		Dysthymics.	Hysterics.
<i>Situation :</i>			
Quarrel with husband, boy friend		7	10
" " parents		3	11
" " people		4	1
Illness, death, loss of husband		7	4
" " " parent, child		8	3
" " " a person		3	3
Ill or troubled in herself		7	6
Sundry		0	2
Unspecified		1	0
<i>Led up :</i>			
Husband, parents, people to blame		4	11
Self to blame		4	5
Blame unspecified		5	3
Illness, death, etc., of husband, parent, etc.		16	10
Own illness or inadequacy		9	6
Sundry		1	4
Unspecified		1	1
<i>Thinking, feeling :</i>			
Grief		15	12
Depression, dejection		14	14
Anger		3	4
Shock		4	5
Anxiety		4	5
Sundry		0	0
<i>Outcome :</i>			
Recovers		20	11
Breaks down, seeks consolation, etc.		4	12
Separation from husband, parents		2	10
Forgiven by husband, parents		4	2
Sundry		0	0
Unspecified		10	5

Dysthymics tend to produce illness themes, usually of parents or husband, whereas hysterics tend to produce quarrelling with parents or husband. Where there have been quarrels, hysterics are much more liable than dysthymics to blame other people rather than either to take the blame on themselves or to leave the question open. There are no differences between the groups with regard to the emotion attributed to the girl. Hysterics tend to break down, dysthymics to recover. Separation from parents or husband is much commoner among hysterics, unspecified conclusions among dysthymics.

If a subject's story be classified as quarrel with husband, husband to blame, anger, separation from husband, that subject would have a dysthymic score of $7 + 4 + 3 + 2 = 16$. The hysteric score would be $10 + 11 + 4 + 10 = 35$. For the present purposes, where there are only two groups, the final score for that picture on the dysthymic-hysteric scale would be $+19$ ($H - D$ score). A similar procedure can be applied to pictures 6GF, 9GF and 13MF. The results can then be summed. By this means 82.5 per cent. of the subjects can be correctly diagnosed on their story content, using the final psychiatric diagnosis as the criterion. Approximately 72 per cent. of cases in which a subsidiary diagnosis was given

were correctly diagnosed, using the dominant diagnosis as the criterion; whereas approximately 88 per cent. of cases, in which a "pure" diagnosis was made, were correctly diagnosed. The percentages of correct diagnoses for each separate picture were: No. 3 = 66; No. 6 = 71; No. 9 = 71; No. 13 = 77.

Table VII shows the results for picture 6GF.

TABLE VII.—*Responses of Dysthymics and Hysterics to Picture 6GF.*

<i>Situation :</i>	Dysthymics.	Hysterics.
Man and woman quarrelling, disagreeing strongly	4 .	17
Man making advances or proposing	9 .	13
Undramatic domesticity	25 .	6
Sundry	2 .	3
Not specified	0 .	1
<i>Led up :</i>		
Man wants affair with woman, to go out with her, etc.	9 .	16
Man accusing woman of infidelity, etc., or she is hiding something	2 .	9
Undramatic domesticity	24 .	9
Sundry	4 .	5
Not specified	1 .	1
<i>Thinking, feeling :</i>		
Woman surprised or displeased	23 .	11
Woman guilty, shocked, frightened	13 .	20
Woman pleased or undisturbed	3 .	6
Sundry	0 .	0
Not specified	1 .	3
<i>Outcome :</i>		
Happy, but undramatic	12 .	3
Woman gets own way	4 .	6
Man gets own way	9 .	9
Woman resists advances, refuses proposal	3 .	11
Woman does not resist advances	4 .	5
Sundry	1 .	1
Not specified	7 .	5

Dysthymics describe a quiet domestic scene in which husband and wife are discussing whether or not to go to the cinema, where to go for their holidays and so on. The wife is surprised or somewhat displeased because her husband wants to go to the pictures or doesn't want to go to Eastbourne or something of that sort.

Hysterics, on the other hand, state that the couple have been quarrelling. He has caught her writing to a lover and she feels guilty, or he is making improper suggestions and she is shocked.

For dysthymics the ending is happy, but undramatic; for hysterics the woman resists the man's advances.

From the scoring method outlined above it is possible to pick out the most typical and atypical dysthymic and hysteric records. The most typical dysthymic record for this picture, given at a speed of eight words per minute, was as follows:

"I should say the husband has just come home from the office or somewhere . . . (and) . . . she looks rather surprised over something . . . (what) . . . perhaps he has got a rise . . . (outcome) . . . perhaps he has asked for a rise so many times, well, you know, she is surprised."

The typical hysteric story, at about forty-three words per minute, was:

"Here is a woman . . . who apparently . . . it looks as though she likes entertaining . . . and so it looks as though she's entertaining . . . she's having . . . a kind of party for a few friends . . . girls and boys (patient's age 32) it looks as though she's flabbergasted about something . . . the young man who is usually her companion at such parties appears to have said something that has upset her . . . (what I don't know . . . I think he wants to be perhaps alone with her and he's asking her) to bring

the party to a close . . . it's her party and her apartment you see, and he's asking her to bring the party to a close and send them home so they can be alone together . . . she's surprised at this . . . and surprised at her companion making such a remark and yet she is curious . . . she likes this man . . . and at the same time she is kind of afraid of him and yet she knows there's nothing to be afraid of . . . she trusts him . . . but she's just curious about him . . . usually when they go out together, if it's in his car, wherever it is . . . she has never had anything to complain about . . . she has always found him most trustworthy . . . but on this particular occasion she's just that little bit afraid . . . she's wondering if one of these days . . . the obvious might happen and so she just doesn't know what to do . . . he's begging of her to let them have the evening together . . . but she likes company . . . she enjoys her friends' company . . . the other boys and girls . . . she doesn't know what to do . . . (outcome) the outcome of it . . . well . . . I think perhaps she just does as he wishes and brings the party to a close . . . and they spend the evening together in her apartment . . . but she finds nothing happens . . . they smoke and drink and talk and play music and have a wonderful evening . . . and then eventually as night is coming on . . . well, in fact, it's early morning, he says goodnight to her . . . and for some unknown reason she is relieved that he is going . . . because she was afraid of something . . . she was afraid he would make love to her . . . and she was afraid that her weakness would make her give in . . . but he doesn't make love to her and she did not give in . . . and, as she tumbles into bed, she thinks to herself, how silly of me to be afraid . . . is that all right?"

Table VIII gives the results of picture 9GF for the same groups.

TABLE VIII.—*Responses of Dysthymics and Hysterics to Picture 9GF.*

	Dysthymics.	Hysterics.
<i>Situation :</i>		
Girl running from woman or man	9	18
Women, or others, in danger from elements	11	13
Girl running to friends, or something pleasant	11	3
Girl running from something	4	0
Sundry	5	6
<i>Led up :</i>		
Girl chased by man, or having affair	4	13
Someone bathing, or wrecked, cut off by tide, or other danger	10	13
Girl and man have quarrelled, or women have	12	5
Girl sees friends, etc., in distance, or is going to bathe	6	2
Sundry	3	3
Not specified	5	4
<i>Thinking, feeling :</i>		
Girl frightened	14	25
Girl depressed, worried, etc.	12	7
Girl enjoying herself	5	2
Sundry	5	3
Not specified	4	3
<i>Outcome :</i>		
Someone is saved	5	11
Girl commits, or attempts, suicide	5	6
Girl remains dominated by other woman	4	3
Happy, but undramatic	7	2
Girl escapes from, or leaves, man	2	4
Sundry	4	5
Not specified	13	9

The characteristic response for dysthymics is that the girl has seen some friends in the distance or that she is running off to bathe. Despite the absence of norms, it would probably be safe to say that this is a misinterpretation of the girl's expression, which would probably suggest fear, anxiety or something of the sort to the majority of normal people. She may, however, be depressed or worried if someone is in danger.

Hysterics state that the girl is running away from a man, or sometimes from the other woman because of a man, or she is making a dash to save someone from the sea. She is frightened.

The outcome of the story is unspecified in the case of the dysthymics, or it may end happily but undramatically; whereas, in the hysterics' story, a dramatic rescue takes place—although sometimes the wife arrives too late to save the husband from drowning.

The typical dysthymic protocol, given at about twenty-four words per minute, was as follows:

"I don't know whether it is the sea or . . . I should say it is two girls on holiday and one has suddenly seen someone in the distance who she thinks she knows and she has got up suddenly to meet them . . . and it is some friends of hers and they join up and make up a party for the day and enjoy the day together."

The typical hysteric story, at about fifty words per minute, was:

"Strangely enough this has got a, this is a spiteful picture to me and, although it portrays two women, I can't help feeling . . . there is a man in it somewhere in this story . . . it has two sides to it . . . one woman is racing along . . . she is frightened of something, she has definitely got some fear, the other one is gloating over

TABLE IX.—*Responses of Male and Female Dysthymics and Hysterics to Picture 13MF.*

	Dysthymics.		Hysterics.	
	Male.	Female.	Male.	Female.
<i>Situation:</i>				
Dead or ill—wife (daughter)	7	20	11	13
Dead or ill—woman	8	5	3	7
Murdered and/or sexually injured—wife	2	3	6	3
" " " " " " —woman	11	8	12	14
Intercourse without injury	4	2	3	1
Woman tempting man	4	0	0	1
Sundry	0	2	3	1
Not specified	4	0	2	0
<i>Led up:</i>				
Sexual intercourse or desire	10	6	13	6
Illness	7	13	9	8
Man's jealousy, cruelty, etc.	4	2	4	6
Woman's infidelity	2	4	2	4
Woman's frigidity, rejection of man	1	1	4	3
Quarrelling (non-sexual)	2	1	3	4
Sundry	3	4	1	4
Not specified	11	9	4	5
<i>Thinking, feeling:</i>				
Man grieved or distracted	14	21	19	17
Man remorseful	14	10	6	12
Man in despair re own future	0	1	4	2
Man indecisive	4	4	2	3
Sundry	1	2	3	5
Not specified	7	2	6	1
<i>Outcome:</i>				
Man desolated and/or seeks help	5	5	5	9
Man soon recovers or leaves woman	8	5	4	8
Man "beats it," escapes consequences	1	0	4	0
Man hanged or imprisoned	5	2	6	7
Man gives self up, or commits suicide	1	4	4	3
Woman recovers	0	4	1	2
Sundry	5	6	8	3
Not specified	15	14	8	8
<i>Details:</i>				
Furniture, books, etc., mentioned	12	14	7	13
Woman's nakedness mentioned	13	4	10	14
Exclamations on seeing picture	4	8	2	7
Poverty of circumstances	5	4	4	8

that other one's fear, her sneaking look round the tree . . . she makes no effort whatever to help that person, she holds back and rather enjoys seeing that other person being hurt . . . I think that is the sea in the distance, it looks like waves and that again portrays fear and, although there is not much in the picture, I feel there is something sexual in this picture, I can't really say what it is, I just don't know, there is divided love in two ways, one . . . I can't see this picture at all as it is painted, not at all . . . there is something furtive about the person who is hiding, I'm afraid I'm very muddled about this picture . . . as you look at it it is just two women and the sea and the trees, but it doesn't imply that to me at all, I feel I would like to express this picture in my own way, but with none of that scenery and yet it implies something sexual to me, but I don't know why . . . that woman could be running to protect a child, but I don't think so, because when a child is in danger I don't think there are many women who wouldn't want to help, but if it was a man, a man she loved, but couldn't have, she might stand by."

For the final picture the two male groups are included—40 anxiety-depressives and 40 non-dysthymics, made up of 22 inadequate or hysteroid psychopaths and 18 hysterics. Table IX, therefore, gives the frequency of classified responses for four groups.

The ratios for sex to illness themes are approximately: for male psychopaths (and hysterics) 3:2, for male dysthymics and for female hysterics 1:1 and for female dysthymics 1:2. If the figure on the bed be taken as the wife or (very rarely) the daughter, she will most probably be described as dead or ill. If, on the other hand, the figure be described vaguely as the "woman," she is more likely to be sexually assaulted with or without murder. Sexual intercourse takes place without physical disaster more commonly in the stories of males than of females.

Females rather more often than males describe the man as grieved or distracted, particularly the dysthymics. Four male psychopaths described the man as in despair about his own future after he had killed the woman. Unspecified responses were much commoner among males than among females, who, however, had more responses falling in the Sundry category.

Most commonly the outcome was unspecified, though less so among hysterics. Five subjects out of eighty stated that the man "beat it" or otherwise escaped the consequences of a misdeed. Four of the five were male psychopaths.

Male psychopaths were less inclined than the remaining groups to describe the furniture, books, etc., in the room. This was actually commonest among obsessional, particularly when the number of items mentioned was taken into account. Female dysthymics more often than the remainder refrained from commenting on the woman's nakedness.

As in picture 4, which has not been presented here, females were more inclined to make shocked exclamations on first seeing the picture. Hysterics were particularly prone to say, for example, "Isn't it shocking?" and then to spend a considerable time on the picture. Female hysterics were also more liable to mention the apparent poverty of the circumstances—usually with a strong implication that this was the man's fault for not working harder, etc. This attitude is neatly illustrated in Guido Vitale's translation of a Chinese poem called "The Brown Shrew":

"Scolding because her husband does not buy cosmetic for her,
But when he has bought cosmetic then she does not use it . . .
Scolding because her husband does not buy a wardrobe,
When he has bought the wardrobe, she does not put her things there;
Scolding because her husband has not bought a cord,
When he has bought a cord, she hangs herself,
And frightens her husband to death."

The typical female dysthymic record, spoken at about nine words per minute, was as follows:

"This looks as though the husband has lost his wife . . . (how) through illness, I suppose . . . that's all I can see in that . . . (what happens to him) . . . what do you mean? . . . (what does he do) can't do anything can he . . . (feeling) broken-hearted I should think . . . that's all I can say for that one."

The typical hysteric record was given at about thirty-five words per minute:

"Oh dear! that picture . . . that woman's not dead . . . she's alive you know . . . she's waiting for that man to wake up . . . don't know whether she can arouse him . . . very sexual, sensual . . . don't know . . . can she be shy? . . .

his face is covered . . . can't tell what sort of man he is . . . how could he resist a woman like that . . . but to me he hasn't gratified that woman's desires or she would have covered herself up . . . she is waiting for him . . . he is afraid . . . she's quite passive . . . different from that one (a reference to picture 4) it's waiting . . . she's waiting . . . she is exposing herself to him and she's leaving the alternative to him . . . the alternative for him wouldn't be right, you see, to love her in the way she wants him . . . but the physical attraction is terrible . . . don't know that it belongs particularly to that woman . . . can't see her face . . . it's just her breast that is so lovely to him . . . he's hiding away from it . . . trying to hide away from it . . . I don't know whether he'll take his hands away from his face and look at her . . . if he does he won't be able to resist her, or whether he'll walk out of that room and shut the door . . . I can't tell you."

The most atypical dysthymic record for picture 13, given at a speed of about thirty-six words per minute, was as follows :

"Well, there is a man overcome with remorse turning his back on a young woman with no clothes on lying on a bed with a sheet over her . . . well, he . . . he is dressed himself so he has spent the night with her; oh, he is not married to her, he has spent the night with her but he suddenly wakes up early in the morning while she is still asleep and . . . and . . . can't think of anything except . . . anyway he gets up without disturbing her and gets dressed and he is going to creep out without waking her up . . . he takes a last look at her, but is filled with shame and he leaves anyway and tries to lead a better life, and the girl, when she does wake up, is furious that he has left her and tries to find him again . . . but, as he was only a chance acquaintance and she doesn't know where to look for him, what kind of work he does, or anything like that, she never finds him."

That appears to resemble more closely the hysteric type of record. The most atypical hysteric record, at about twenty-three words per minute, was :

"Well, it could be father and daughter . . . I think, I think the man is too old to be her husband and I suppose she is very ill and he is very unhappy . . . it might have been caused because they are poor . . . (outcome) well, if somebody helps them she might get better . . . (and) well, it could be the beginning of better things because the situation came about when people realized things about them they had not realized before."

That appears rather closer to the typical dysthymic type of story.

Shocked exclamations were much less frequent in the record of men, sex themes were rather more common, in picture 13 intercourse did occasionally take place without disaster though followed by feelings of remorse, anti-social behaviour was sometimes allowed to go unpunished. In the main, however, sexual intercourse was regarded as an extremely hazardous undertaking fraught with the most dire physical and psychological consequences. The effect of the sex of the tester on the subject's freedom of expression is a relatively unknown factor.

The greatest difference on the test lay between male psychopaths on the one hand and female dysthymics on the other. This seems a clinically valid antithesis. Both fundamentally believe in the omnipotence of thought. The psychopath has only to want something to happen for it to be in process of happening; the obsessional has only to want something not to happen for it to be in danger of happening.

THE RELATIONSHIP BETWEEN CONTENT, PRODUCTIVITY AND FLUENCY.

The relationship between content, productivity and fluency is being considered for the 40 female dysthymics and 40 hysterics discussed in the previous section. Table X shows the means and standard deviations of the two groups on these scoring categories for pictures 3, 6, 9 and 13.

TABLE X.—*Content, Productivity and Fluency Scores of
Dysthymics and Hysterics.*

Score.	Dysthymics. (40).	Hysterics. (40).	S.D. within groups.
"Dysthymic" . . .	184.125	137.600	32.323
"Hysteric" . . .	143.700	171.900	25.563
Productivity . . .	117.250	161.825	79.034
Fluency . . .	25.900	34.025	10.235

The relative efficiency of the four variables for distinguishing between the groups can be expressed by the percentage of the total variance accounted for by distinguishing between the means. The "dysthymic score" accounts for 34.7 per cent. of the variance, the "hysteric score" for 23.8 per cent., the fluency score for 13.9 per cent., and the productivity score 7.5 per cent. The first three variables are significant at the 1 per cent. level of confidence and the last at the 5 per cent. level.

The following correlations were obtained from total variances and covariances (79 d.f.): Productivity and fluency 0.361; productivity and "dysthymic" score - 0.313; productivity and "hysteric" score 0.128; fluency and "dysthymic" score - 0.335; fluency and "hysteric" score 0.165; "dysthymic" score and "hysteric" score - 0.237.

Weights for the best possible combinations of from one to four variables were calculated. However, the discrimination provided by content score alone was not increased significantly by adding productivity and fluency, even with optimum weights. These latter scores may, of course, add appreciably to the discriminative value of the test where other groups are concerned.

Dysthymics produce briefer stories at a slower rate, and the stories that they do produce differ from those produced by hysterics.

There are no significant differences between the means of any pair of the ten pictures for productivity and fluency. The content of the stories naturally varies with different pictures. Of the six pictures that have been analysed in full No. 13 has the highest discriminative value, followed by 9 and 6, 3, 4, 1. The remaining four have been discarded on the basis of clinical experience without putting their discriminative value to any statistical test. From a consideration of these pictures it appears probable that the more provocative, the more ego threatening pictures have the higher discriminative value. This would follow from the fact that dysthymics tend to take the line of least resistance by adhering firmly to the details of the picture itself or, if they stray from it, by producing stories which have been classified as "undramatic domesticity." They remain well within the bounds of their own actual experience. Even the relatively low-level creativity required for the production of simple day-dreams probably calls for greater effort.

The hypothesis, which has been put forward in greater detail and tested elsewhere (4), is that awareness of their own emotional disturbance is so persistent and pervading with dysthymics that competing stimuli must have a more than usually high positive valence before they can be held in the focus of attention uninterruptedly. Desai's claim that Spearman tends to minimize the influence of orectic on cognitive factors may be true (2), but Spearman did nevertheless recognize the fact that affective competition could influence the constancy of cognitive output (12).

In the case of hysterics, the more provocative the picture the more they will elaborate their stories. The hysteric seems partially to dissociate the extremely conventional aspect of her personality from the more unruly covert aspects. She can thus enjoy consciously condemned activities by failing to recognize them as part of her "self." She will, therefore, tend to produce lengthy stories and, because of her absorption in them, she will produce them fluently.

Thus she appears fascinated by sex, that is attracted and repelled in almost equal degree. Improper suggestions are being made. She is exhilaratingly frightened and regretfully resistant. She is being chased by a man; but, like Robert Louis Stevenson, she finds it better to travel hopefully than to arrive. Stories told in novelettish style often imply daydreams of romantic love which have been shattered by the shiftlessness or brutishness of her husband. This severe setback presumably tends to increase the dissociation between daydream and reality. The attitude just below the surface of her prim, romantic conventionality is aptly illustrated, however, by Balzac's young lady who, when pursued by a lustful man, tripped over a blade of grass. The dynamism itself is, however, more nearly explained by substituting the word "thought" for "did" in Nietzsche's graphic dictum: My memory says that I thought it, my pride says that I could not have thought it, and in the end, my memory yields. It is claimed that in the T.A.T. pride is hoodwinked.

SUMMARY.

1. The administration of the test has been described and the method of classifying the responses to it.

2. It has been shown that hysterics tend to start their stories more quickly than dysthymics and to tell longer stories at a higher speed.

3. The type of story produced by dysthymics has been shown to differ from that produced by hysterics. A crude method of measuring something of that difference has been described.

4. Productivity and fluency correlated 0.361; productivity and "dysthymic score" — 0.313; productivity and "hysteric score" — 0.128; fluency and "dysthymic score" — 0.335; fluency and "hysteric score" — 0.165; "dysthymic score" and "hysteric score" — 0.237.

5. A possible explanation was offered for the low productivity and fluency of dysthymics and for the high productivity and fluency of hysterics.

6. Examples of the most typical stories, selected by the scoring method, for "dysthymia" and for "hysteria" were given in order to illustrate the fact that the results obtained by this method are, in the main, congruent with clinical judgment.

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THE SIGNIFICANCE OF BRAIN ACETYLCHOLINE.*

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UNTIL a few years ago there existed a sharp dichotomy of opinion between the pharmacologists, who, on the basis of their experiments, assigned to acetylcholine the role of universal synaptic transmitter, and the electrophysiologists, who denied that this substance could effect the transfer of excitation from one conducting element to another. It is, however, now generally agreed that, certainly at the neuromuscular junction, and probably also at ganglionic and some—but not all—central synapses, acetylcholine does indeed exert a primary transmitter action. It must be added that recognition of this fundamental action has been hastened as a result of recent experiments by those very electrophysiologists (such as Eccles and his colleagues) who previously supported exclusively electrical hypotheses of nervous transmission. For this reason the assumption which is implicit throughout this paper that the acetylcholine in brain is concerned in maintaining central synaptic transmission is likely to go unchallenged and requires no detailed justification here.

At the same time it is necessary to guard against the acceptance of too simple a theory of acetylcholine action in the brain, and to avoid the unrestricted application to central synapses of results derived from experiments on the anatomically simple neuro-muscular junction. It is, for instance, difficult to believe that the action-currents in the networks of pre-synaptic nerve-endings which form the "synaptic scale" of many central neurones do not influence cerebral excitability and impulse transmission in a way which is impossible at less complex junctions.

Actuated by the desire to find a unifying principle to explain the diversities of nervous activity and by the hope of designing a rational therapeutics of nervous and mental disease, many have unguardedly accepted the hypothesis that anaesthesia occurs when the synthesis of acetylcholine in the brain is inhibited, and that convulsant drugs effect their action by allowing the accumulation of acetylcholine. The experiments to be surveyed in the present paper indicate that this view is untenable, but they also point the way to other investigations which might well lead to the elucidation of one aspect of the transmitter function of acetylcholine in the brain.

A more detailed description of the methods and results of the experiments to be described, as well as a more extensive discussion of their significance, is being published elsewhere.

ACETYLCHOLINE AND ANAESTHESIA.

Several groups of workers had previously obtained evidence which indicated that the amount of acetylcholine in brain increases during anaesthesia (Tobias, Lipton and Lepinat, 1946; Richter and Crossland, 1949; Elliott, Swank and Henderson, 1950), but the present study has carried these results further. They can be briefly summarized as follows:

No change in the concentration of acetylcholine occurred during the induction of anaesthesia, apart from a small and variable fall during the stage of excitement. After anaesthesia developed, the amount of acetylcholine began to rise and reached, within a few minutes, a new stable level. Prolongation of anaesthesia for periods of up to two hours had no further effect on the acetylcholine concentration, which could, however, be increased by deepening the anaesthesia. These effects were observed on rats treated with seven different anaesthetics, on rabbits anaesthetized with ethyl chloride or "Dial," and on mice anaesthetized

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with ether or "Dial." It is evident that the acetylcholine changes occurred secondarily to the development of anaesthesia; it is also clear that any inhibition of synthesis was insufficient to prevent an appreciable increase in the amount of acetylcholine presumably available for synaptic transmission. The actual percentage increase in the amount of acetylcholine in the brain differed, not only from species to species, but also in different age-groups of the same species. For any age-group of any particular species, however, the fractional increase, at any given depth of anaesthesia, was remarkably constant. Table I, for instance, shows the effect of deep anaesthesia in young rats. A more detailed investigation than that

TABLE I.—*The Effect of Deep Anaesthesia on the Acetylcholine Content of Young Rat Brain.*

(Each anaesthetized animal was paired with an unanaesthetized litter-mate; the figures show the mean fractional increase in acetylcholine content, and the standard error of the mean, determined from that number of pairs of animals indicated in brackets.)

Chloralose	1.54 ± 0.09 (10)
Chloroform	1.61 ± 0.10 (7)
"Dial"	1.58 ± 0.09 (8)
Ether	1.62 ± 0.08 (13)
Ethyl chloride	1.50 ± 0.08 (5)
Pentobarbitone sodium	1.47 ± 0.08 (7)
Thiopentone	1.59 ± 0.13 (7)

whose results are recorded in Table I showed a just significant difference ($P = 0.05$) between the effects produced by ether and by pentobarbitone, but this difference probably arose because of the difficulty of preventing some anoxia in the pentobarbitone-anaesthetized animals. It was shown to occur entirely as a result of differences in the concentration produced by the two anaesthetics in the cerebral cortex, and it was not found at all in adult rats, which are known to be less susceptible to anoxia than are young animals. Moreover, the full rise in the acetylcholine concentration of the cortex could be prevented by anoxia.

Not only was there no evidence of a decrease in the acetylcholine content of whole brain during anaesthesia, but other experiments made it clear that all parts of the brain participated, though to different degrees, in the increase noted for whole brain. The pattern of distribution of acetylcholine in different regions of the anaesthetized brain was remarkably similar whether ether or pentobarbitone was used, and this may indicate that these two anaesthetic agents have similar sites of action, though they are usually regarded as acting preferentially on different regions of the brain. Thus, in light anaesthesia there was a marked rise in concentration in the cerebrum and the medulla and a smaller rise in the brain-stem. As anaesthesia deepened, the concentration in the former two regions showed a further but relatively small increase, while that in the brain-stem was more marked than before.

Further experiments excluded the possibility that these changes in acetylcholine content arose from stimulation of its synthesis, or from inhibition of cholinesterase activity, and it seems that they must have been due to the decreased liberation, consequent on the decreased central activity, of acetylcholine from neurones containing it. The fact that the acetylcholine level rose, in light anaesthesia, fairly rapidly to a stable level above that in the normal animal demands the introduction of a second assumption: that the amount of acetylcholine liberated per impulse depends on the amount actually present in the fibre. There is good evidence that this condition obtains in sympathetic ganglia (Rosenbluth, Lissak and Lanari, 1939), and no reason to doubt its validity in the central nervous system; with deep anaesthesia it seems possible that the brain became completely "saturated" with acetylcholine, and could bind no more in the form of the inactive complex in which it is normally held. This would explain the constant increase found in deep anaesthesia brought about by different agents, as well as the fact that, notwithstanding differences in the normal animal, the acetylcholine content of the brains of anaesthetized adult and young rats were not significantly different from one another.

The changes occurring in anaesthesia are best regarded, then, as adaptations to the decreased central activity, and further consideration of their possible signi-

ficance is best deferred until after the experiments with convulsant drugs have been considered.

ACETYLCHOLINE AND CONVULSIVE ACTIVITY.

Many attempts have been made in the past to seek evidence that convulsant drugs operate by causing an accumulation of acetylcholine in the central nervous system, but it now seems clear that no such relationship exists (Feldberg, 1945). The specifically anti-cholinesterase drugs form no real exception to this generalization, for they simply preserve endogenously liberated acetylcholine so that it can reach concentrations at which it exerts a convulsant action—and other cholinergic effects—in much the same way as if it were directly injected. It is very doubtful whether any compound with the weak anti-cholinesterase activity of many other types of drugs could, by virtue of this property alone, exert a convulsant action. At the same time it might well be that the potency of an otherwise mild convulsant would be increased if the compound also possessed some anti-cholinesterase activity. It is similarly possible, as will be mentioned later, that convulsive potency might be augmented in convulsants which also stimulate acetylcholine synthesis.

It must be emphasized that, since acetylcholine exerts powerful pharmacological actions, care must be taken in interpreting the results of observations of the effects which follow its parenteral injection. The ease, for example, with which *grand-mal* convulsions can be precipitated in the epileptic subject by the injection of acetylcholine, or of an anticholinesterase drug, bears witness to the abnormal irritability of the brains of these patients to any excitatory substance or stimulus, rather than to the participation of acetylcholine as an aetiological factor in the development of spontaneous convulsions.

Our experiments have shown, however, that, as with anaesthesia, regular changes do occur in the concentration of acetylcholine in the brain during convulsions, but that these changes are secondary to the convulsive activity itself.

We have tried, using rats and rabbits, to correlate changes in the electroencephalogram (E.E.G.) with changes in the concentration of brain acetylcholine and with its liberation into the blood and cerebrospinal fluid. It will probably be necessary later to consider also the mutual effects of the convulsions and other humoral factors.

If the maximum dose of a convulsant drug (we have, for the most part, used leptazol and picrotoxin) is injected into an animal, clonic convulsions appear after a short latent period. As the concentration in the brain rises, these convulsive movements become more and more violent, to culminate in the precipitation of a tonic extensor seizure in which all four limbs show a prolonged and intense extensor spasm. Following this extensor spasm, and after a variable period of relative quiescence, during which the animal lies in a quite flaccid condition, clonic convulsions, much less violent than before, return and continue, with gradually decreasing severity, over a variable period until convulsive activity finally ceases. This last phase is complicated by anoxia, which becomes most severe during the tonic extensor spasm and which is contributed to by several factors: the great metabolic demands made by the early violent convulsions, the apnoea which accompanies the tonic extensor phase and laryngeal spasm.

The work of Goodwin, Kerr and Lawson (1940) showed that the tonic extensor spasm represents the peripheral manifestation of a widespread and intense cerebral excitation, and Toman, Swinyard and Goodman (1946) have adduced evidence that during such a seizure the brain receives the maximum stimulation of which it is capable. The clonic convulsions represent the effect of less intense excitation.

TABLE II.—*The Acetylcholine Content of Young Rat Brain at Different Times During the Course of Convulsions Induced by Leptazol.*

(Mean, and standard error of mean, of results of experiments on 5 groups of litter-mates.)

	$\mu\text{g./gm.}$ wet weight of brain.
Normal	2.5 ± 0.22
At onset of convulsions	2.4 ± 0.20
During first clonic phase	1.8 ± 0.22
During tonic extensor spasm	1.4 ± 0.02
During second clonic phase	1.4 ± 0.14

Table II shows the results of a typical experiment on the acetylcholine content of the brains of a series of young rats convulsed with leptazol. Results quantitatively very similar were obtained with picrotoxin and in experiments on rabbits. It can be seen that the concentration of acetylcholine in the brain remained steady until the convulsions set in; there was then a fall during the clonic convulsions and a further fall during the tonic extensor spasm. It should be added that this latter change was more precipitous than the figures would indicate, for it occurred over the two or three seconds required for the development of the extensor phase: the earlier fall required about fifteen seconds to develop fully. It will also be noted that, following the extensor spasm, the acetylcholine concentration showed no recovery when the second clonic phase began. This continued low concentration of acetylcholine was probably due to the anoxia already mentioned, for it did not occur after the tonic extensor phase of electrically-induced convulsions (Richter and Crossland, 1949) where the experimental conditions were such that deep anoxia was prevented.

These effects were probably due to the increased rate of release from cholinergic neurones, and we have, indeed, been able to detect acetylcholine in the bloodstream during the extensor spasms. Our attention was first drawn to this possibility by the invariable association, in rats, of the extensor tonic spasm and chromodacryorhesis (the secretion of the so-called "bloody tears" from the Harderian glands, which are specifically stimulated by low concentrations of acetylcholine). It has since proved possible to detect acetylcholine in the blood at this time by the usual biological methods. It is assumed that this acetylcholine escaped the normal enzymic barriers in the brain and persisted for a time in the blood because of its low concentration, which would delay its hydrolysis by serum cholinesterase.

The changes in the acetylcholine content of the brain—more especially those occurring during the clonic phase—must probably be regarded as adaptations to the changed physiological conditions and not as manifestations of an exhaustion of the supplies of acetylcholine. This interpretation is best supported by some experiments we carried out on rabbits, anaesthetized with "Dial." The intraperitoneal injection of leptazol into such animals caused the outburst of prolonged spike activity in the E.E.G.,* which exhibited none of the alternating periods of quiescence and activity which occur so often in records taken during convulsions and which, for obvious reasons, lead to equivocal results when used in the type of experiment described here. This continuous spike activity was associated with a fall in the acetylcholine content of the brain, but this occurred early and was thereafter independent of the duration of the experiment. Thus in one series of rabbits (in which the acetylcholine of the cerebral cortex only was studied) the mean content of the cortex of the animals under "Dial" was $2.1 \mu\text{g./gm.}$ (4 experiments). In animals whose E.E.G. had shown spike-potentials for 10 minutes, the cortical concentration was only $1.3 \mu\text{g./gm.}$; after 35 minutes of this activity it was still $1.4 \mu\text{g./gm.}$ (4 animals).

Notwithstanding these experiments, it is clearly possible that the brain requires a minimum concentration of acetylcholine in order that normal activity can be maintained, and it is possible, too, that under extreme conditions the amounts available might approach this critical minimum. Such a condition would imply that, other things being equal, those convulsive agents would be most effective which promoted synthesis of acetylcholine, and prevented abnormal falls in its concentration consequent on, for example, circulatory or respiratory embarrassments occurring during the course of the convulsions. There is some evidence of a general tendency for powerful convulsant agents to stimulate acetylcholine synthesis (Torda and Wolff, 1947), but it must be emphasized that this stimulant action is probably only exerted when the supplies of acetylcholine become depleted, for there is no evidence that these convulsant drugs increase the concentration of acetylcholine in brains carrying their normal complement.

Similarly, it seems reasonable to believe that those anti-convulsant compounds might be most effective which tend to inhibit the synthesis of acetylcholine or to accelerate its destruction.

There is as yet no direct evidence for the existence of a critical minimum acetylcholine concentration, but we found that when the convulsive activity of the rabbits

* These records, and others referred to subsequently, were demonstrated at the Cardiff meeting.

under "Dial" and leptazol was abolished by subjecting the animals to artificial respiration with nitrogen, the flattening of the E.E.G. was accompanied by the reduction of the cortical acetylcholine concentration to 0.82 $\mu\text{g./gm.}$ from its previous value of 1.4 $\mu\text{g./gm.}$ It will also be recalled that, following the extensor tonic spasm induced by chemical convulsant agents, the clonic convulsions were but weak, and were associated with a persistently low concentration of acetylcholine. Neither of these observations, of course, gives any real evidence that an abnormally low acetylcholine content and reduced central activity are causally related, and this possibility is, in any event, irrelevant to the main point which has emerged from the studies described here: that, contrary to expectations, the content of acetylcholine in the brain is adjusted in such a way as to increase during depressed central activity and to fall during heightened activity.

An interpretation of the significance of such an adaptive mechanism awaits the results of further experiments, but it does seem reasonable to assume, as a tentative hypothesis, that these changes in acetylcholine concentration during convulsions or other forms of heightened cerebral activity, by reducing the amount liberated at each impulse, reduce the possibility or "over-stimulation" of the nervous system. Alternatively, by preventing the temporary accumulation of too high a concentration of acetylcholine at the synapse, "inhibition" might also be prevented. The converse effects would be found during anaesthesia. One is reminded of the rather similar theories which have been advanced to explain the action of adrenaline on transmission at sympathetic ganglia.

Two lines of approach might help to test these hypotheses: It is hoped to determine first whether the effects of given doses of exogenous acetylcholine on central transmission differ according to the degree of nervous activity already prevailing. The other possible line of approach will attempt to maintain the acetylcholine level in the brain during convulsive and other forms of activity at concentrations other than those normally found. One interesting piece of information of the type to be expected from this latter line of investigation has been obtained from the experiments on rabbits already referred to. If, after the abolition of convulsive potentials by anoxia the animal was given pure oxygen, the convulsive potentials returned after a time with a distinctly higher amplitude than at any time in the entire period preceding anoxia. It appears that during this post-anoxic phase acetylcholine synthesis was stimulated, for the period of enhanced spike potentials was associated with a correspondingly elevated acetylcholine concentration.

Acetylcholine is present in, and is synthesized by human cerebral tissue; it can also be detected in the cerebrospinal fluid of epileptic subjects following major seizures (Tower and McEachern, 1949). These, and many other lines of evidence, indicate that the conclusions derived from our animal experiments are probably applicable also to man, and may eventually yield results of clinical significance.

ACKNOWLEDGMENTS.

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EPISODIC RAGE, THETA RHYTHM, AND OBSESSIONS.

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THE association of an abnormal electroencephalogram with obsessive-compulsive states has been investigated by Pacella *et al.* (1944), who found in these states a higher incidence of "convulsive-type" patterns, consisting of occasional or frequent runs of serial 2-4 c/s potentials of high amplitude than in a random control group. In most of the cases this type of activity was only noted after a period of hyperventilation not exceeding two minutes.

The case reported here is of interest because an abnormality of this kind, easily appearing on hyperventilation, was observed to be present nearly two years before characteristic obsessional symptoms developed. The patient originally came under observation on account of attacks of explosive rage, and in addition to this delta activity (0.5-3.5 c/s) appearing on overbreathing he showed a conspicuous theta rhythm (4-7 c/s) in the resting record.

Electroencephalograms taken three years apart were more or less similar, but in the more recent record the abnormal rhythms were slightly more pronounced.

CASE HISTORY.

An electrical maintenance engineer, aged 22, was admitted to the Cheadle Royal Hospital after he had damaged a valuable piece of mechanism in a fit of explosive rage.

All physical investigations were negative, and there was no history of mental or nervous disorder in the family.

The patient was of good intellectual attainment, and during the war had served in the R.A.F. with the rank of flight-sergeant. There was no history of serious bodily illness apart from childhood exanthemata and several attacks of malaria during his war service. At school he had been rather solitary, and had not mixed much with other boys, being more interested in his hobbies.

Since demobilization he had been moody and irritable, with frequent outbursts of rage. These, however, were no new feature, as he recounted an incident when, at the age of 14, he had flung an open penknife at another boy; but their frequency had increased within the last year or two. During the war he had been badly beaten up on two occasions.

He showed no sociopathic features apart from these episodes of extreme irritability, but the general trend of his conversation tended to dwell on various personalities he had known who had been "slick" and could make money "the easy way."

He was extremely capable at his job, and showed much insight into and concern over his condition.

During his stay in hospital he had several attacks of irritability. Though these might occur at any time of the day, they seemed to be present mostly in the mornings. If he were spoken to when in one of these moods he would wave his hand and say, "I'm not fit to talk to at the moment; you'd better move on." The administration of sodium amytal in 3-gr. doses sometimes seemed to clear the air or abort the more serious manifestations of the attacks.

Frequently this period of irritability culminated in an explosive episode in which he became extremely tense and irritable, moving restlessly up and down, and obviously having to exert the greatest control to prevent himself from striking out. This usually cleared in half an hour or so, and he was then normal and apologetic. There was never at any time loss of consciousness, and characteristic epileptic phenomena of a major or minor nature were neither recorded in the past history nor noted during the period of observation. In the mistaken belief that there was a depressive element in his condition he was given E.C.T. It was, however, dis-

continued after three treatments, as he failed to show any mental response to it.

In June, 1948, a week after his last treatment, the first E.E.G. examination was carried out and reported on as follows:

"The resting record (Fig. 1*a*) is dominated by a diffuse medium voltage theta rhythm at 5-6 c/s in all areas. The activity is maximal in anterior leads, notably anterior temporal.

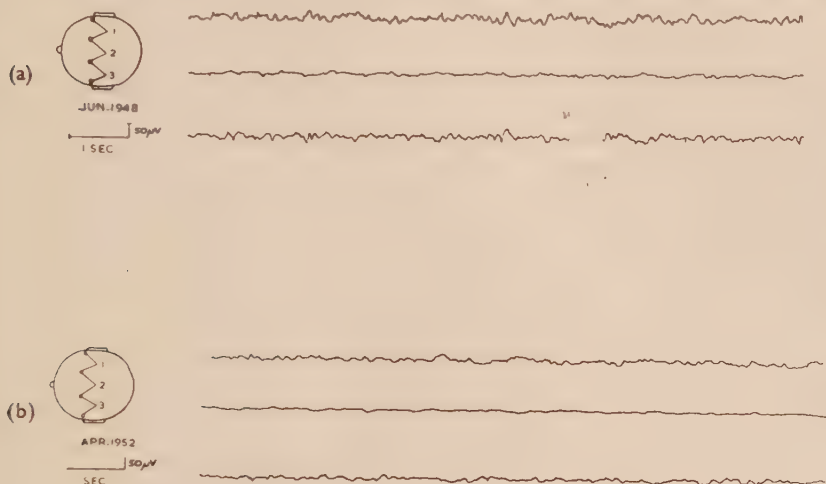


FIG. 1.—Resting record, June, 1948(*a*), and April, 1952(*b*).

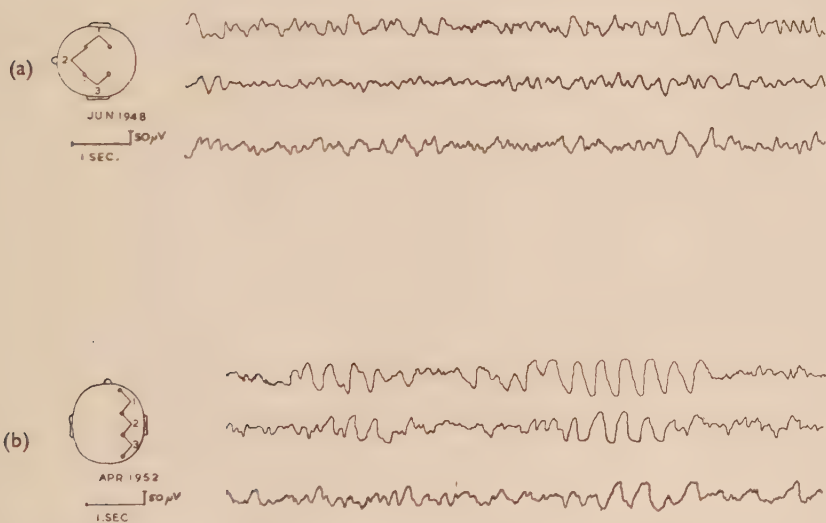


FIG. 2.—Hyperventilation record June, 1948(*a*), and April, 1952(*b*). In each case the hyperventilation record begins after $2\frac{1}{2}$ minutes' overbreathing, which is continued for a further half minute.

"There is a poorly sustained low to medium voltage alpha rhythm at 10-11 c/s which is symmetrical and is inhibited by visual stimuli. A background of low voltage irregular fast activity is present throughout the record.

"Hyperventilation (Fig. 2*a*) considerably augmented the resting rhythms, and easily induced widespread high voltage irregular delta activity at 2-2.5 c/s. The response was slightly prolonged.

"The E.E.G. is very abnormal and shows a marked general dysrhythmia of a non-specific nature. The overbreathing response is suspiciously unstable, but is somewhat

slower than the response usually obtained in epilepsy, and no typical epileptic activity was seen. The record is quite symmetrical, and there is no evidence of any focal disturbance.

"The record was taken one week after E.C.T. had ceased, but although the abnormalities have probably been augmented I do not think they are entirely due to the treatment." (J. Hillis.)

After this the patient was put on $\frac{1}{2}$ gr. of phenobarbitone *b.d.* and discharged from hospital. In the next six months he was seen on 16 occasions as an out-patient so that the general psychological background could be assessed and his progress recorded. During this time his phenobarbitone was gradually discontinued, and when a second E.E.G. examination was carried out six months later (December, 1948) he had been without anticonvulsant drugs for six weeks. The examination showed little change from the previous one, except that the alpha rhythm was now slightly more sustained.

In the period under review only three episodes of significance occurred: once he threw a spanner at a fellow-workman; once he tore a towel into shreds; and once, when being interviewed, he panicked and fled.

There was no evidence of sustained depression, but his affect was unstable, showing a rapid fluctuation from depression to elation. At this time compulsive phenomena were absent and they were not reported in the past history. When they did appear he was specifically asked if he had been low-spirited of late, and again he gave a history of rapid fluctuation of mood, but no sustained depression, and he only admitted the presence of compulsive symptoms during the preceding year. There were, however, at this stage (1948) some anxiety-phobic symptoms: a fear of knives which had been present for some years; and a more recent fear that he might injure the members of his family.

In response to a follow-up letter sent $2\frac{1}{2}$ years (1952) after he was last seen, the patient replied saying that he thought he had gained a little more self-control, the only misdeeds in the interval being two wrecked telephones. In addition, he reported as follows:

"I find myself anxious about trifles, go back to the garage to check the car lights are off, lock doors two or three times, wash my hands too often it seems, walk around picking bits from the floor."

These symptoms he reported had been present for over a year. A further E.E.G. examination was arranged and was reported on as follows:

"The resting record (Fig. 1*b*) is now of low voltage throughout, and shows a moderately sustained alpha rhythm at 10.5–12 c/s which is symmetrical and normally responsive to visual stimuli, but is much less sustained than in the last recording. A diffuse theta rhythm at 4.5–6.5 c/s still appears in all areas, dominating the record, and remains maximal in anterior leads, notably anterior temporal. A background of irregular fast activity is again present throughout the record.

"Hyperventilation (Fig. 2*b*) augmented the resting rhythms, and again easily induced widespread irregular delta activity with an intermittent high voltage rhythmic discharge at 2.5 c/s in anterior leads which has become more marked and more widespread. The response was, on this occasion, slightly prolonged.

"The E.E.G. still shows a marked general dysrhythmia, but the alpha rhythm is not quite as strong as it was in December, 1948, and the overbreathing response is more unstable, so the record is just a little more abnormal than the previous recording. There is still no asymmetry, however, and no evidence of any focal disturbance." (C. Breslin.)

DISCUSSION.

The assessment of this case presents several problems. Is the patient to be regarded as a "latent" epileptic? The hyperventilation response on the E.E.G. with the appearance of a high voltage rhythmic delta discharge (0.5–3.5 c/s), especially marked in the more recent record, is suggestive of potential epileptic activity; and although there were no typical epileptic features in the clinical history the aggressiveness was unquestionably paroxysmal, and the patient returned to a reasonably normal level between attacks. Moreover, his personality was good, and there were no real sociopathic features.

Although it is known that delta activity can be induced in normal subjects on hyperventilation, especially when the blood-sugar level is low, the ease with which it appeared in this patient, and the amount, places the record beyond the limits

of normal, even although the recordings were not covered by the administration of glucose. In the series described by Pacella *et al.* (1944) two of the patients had, in addition to the obsessional symptoms, *petit mal* attacks; while the association of compulsive symptoms with epilepsy has been commented on by Garmany (1947), who quotes several examples in which epileptic attacks and obsessions have been combined in the same person.

It is difficult to interpret the personal case which Garmany quotes, as the appearance of the obsessional symptoms seemed to be associated with an involutional-type depressive psychosis.

The activation of obsessional symptoms in the course of a depression has frequently been emphasized (Stengel, 1948; Jarvie, 1950). However, there was no doubt that Garmany's patient had an obsessional personality.

In the case described above the patient denied any particular degree of depression and described his present mood exactly as he had described it 3½ years previously. There was no evidence of compulsive symptoms in the past history, but there were some anxiety-phobic symptoms. Anxiety-phobic symptoms are in a sense a stage towards more formalized compulsive phenomena.

Schilder (1938) has drawn attention to the organic background which is associated with a high proportion (not less than one-third) of obsessional states, and emphasizes the importance of excluding signs of chronic encephalitis. The cases described by Pacella and his co-workers were, however, selected so that all patients were neurologically normal, and cases with definite head trauma or with encephalitic involvement were excluded.

Rockwell and Simons (1947) found some correlation between the stability of the personality and the stability of the E.E.G. pattern. Using the criteria laid down by Gibbs *et al.* (1943) to decide the abnormality of the record, they found only 2 abnormal E.E.G.'s in a group of 11 well-organized personalities with uncomplicated obsessive-compulsive neuroses, as compared with 10 patients classified as having psychopathic personalities with obsessional symptoms, all of whom had abnormal E.E.G.'s, although 2 were regarded as being border-line.

The conspicuous theta rhythm (4-7 c/s) in the present case is fully in keeping with the aggressive quality of the attacks. An excess of this rhythm was shown to be the most prominent feature of the abnormal E.E.G. found in aggressive psychopaths (Hill and Watterson, 1942). It was mainly post-central in origin, and, since it was bilaterally synchronous, Hill (1944) suggested that its origin lay in deep mid-line structures, a hypothesis which has received support from its appearance in lesions involving the third ventricle (Cobb, 1944; Walter and Dovey, 1944). Its origin from near hypothalamic levels would be consistent with its emotional associations.

Grey Walter (1950a) finds it to be the dominant rhythm in children of the 2-5 age-group, but it has generally become small and intermittent by the age of 10.

"In children (Grey Walter, 1950b) the theta components are exquisitely responsive to emotional stimuli, with the aid of which two or three components in this band can be recognized. With advancing maturity the effect subsides, and in the normal adult only the most disagreeable stimuli can produce any effect of this sort. In fact, few experimenters have tried seriously to evoke theta activity in normal adults because to be effective the stimulus must be authentic and thoroughly offensive. Certainly the appearance of a theta rhythm is a good sign of bad temper."

As Hill and Watterson (1942) have pointed out, many of the records of young psychopaths would pass for normal in children, and Hill (1944) has advanced the idea that adult aggressive psychopathy "is produced by a failure of development in the central nervous system." He states (1950) that "the excess of theta rhythm observed by many workers in behaviour problem children is the same type of abnormality as that seen in the adult psychopath, yet all children with such disorders do not become psychopathic adults. Indeed, comparing the incidence of behaviour disorders in children and adults, one would expect a greater incidence of abnormal records among adults, if there was not some process of maturation occurring."

It might be suggested that where such maturation has failed to take place the nervous system may attempt to reach stability by the development of symptoms having a peculiarly inhibitory quality—namely, obsessive-compulsive rituals.

The development of such symptoms seems, however, to be associated—if any association may be claimed at all—with the paroxysmal rather than with the aggressive aspects of the unstable nervous system.

It is certain, however, that the association of obsessional phenomena with cerebral dysrhythmia requires further controlled investigation. It may well be that part of the understanding of these phenomena will lie in a more careful assessment of certain underlying neurophysiological mechanisms. It is hoped that the presentation of this case will stimulate interest in this direction.

SUMMARY.

A case is described of a young man who first came under observation with attacks of episodic rage and who developed ritual obsessions almost two years later.

Electroencephalograms taken before and after the compulsive features appeared showed a conspicuous resting theta rhythm (4–7 c/s), while a prominent delta rhythm (0.5–3.5 c/s) appeared on hyperventilation, the latter being more marked in the recent record.

The literature connecting obsessive-compulsive symptoms with abnormal electroencephalograms and with epilepsy is discussed in the light of this case, and it is suggested that there is sufficient evidence to warrant further controlled investigation of possible relationships between the phenomena.

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PSYCHOLOGICAL AND SOCIAL ASPECTS OF PSYCHIATRIC DISORDERS IN THE AGED.

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COOK, Dax and Maclay (1952), studying the population over age 65 in the public mental hospitals in England and Wales, showed that, for the ten-year period 1938 to 1948, the percentage of patients over age 65 to the total mental hospital population rose by approximately three times as much as the per cent. increase in the general population of those over age 65 to the total population. However, in addition to the magnitude of the problem of mental ill-health in the aged, its many aspects involve extensive fields where knowledge is still lacking. In consequence, it is extremely desirable to investigate more fully the psychiatric disorders occurring in old people, and the increasing importance of these maladies—especially their social significance—has prompted the present study.

THE MATERIAL OF THE INVESTIGATION.

The following four groups of subjects were studied :

- Group 1 : A normal control group of elderly subjects who were living in their own homes.
- Group 2 : Residents in the Salvation Army's Eventide Homes.
- Group 3 : Patients in the Ambulant Division of a geriatric hospital.
- Group 4 : Elderly patients in a mental hospital.

Each group contained 24 subjects, totalling 96 subjects in the entire investigation.

The groups were suitably matched for age, sex, and socio-economic status and, in addition, a measure of selection was considered necessary. The salient features of the matching and selection procedures were as follows :

- (1) The minimum age of the subjects studied was 65.
- (2) Each group contained an equal number of men and women (12 of each sex).
- (3) All the subjects were drawn from the "lower income group." The assessment of the socio-economic status of each subject was based on the following considerations :
 - (a) The subject's maximum earnings prior to World War II. (If these earnings exceeded £4 per week, the subject was excluded from the study.)
 - (b) In the case of a housewife, the occupation of the husband.
 - (c) The general environmental background emerging from the entire interview.
- (4) Only those subjects were included in the study who were able to respond to questioning by giving relevant replies.
- (5) A minimum amount of basic information concerning the past history of each subject was considered necessary, and unless this material was forthcoming, the subject was excluded from the study.

Within the limits of the matching and selection procedures, twelve male and twelve female subjects were investigated in each of the four groups, the subjects in Group 2, 3 and 4 being dealt with in the order in which they were admitted.

In each of the four groups the mean age of the subjects for the sexes separately and combined was calculated (Table I).

TABLE I.—*Mean Age of Subjects at Time of Interview.*

	Group 1.	Group 2.	Group 3.	Group 4.
Males . . .	76 $\frac{1}{2}$	77	78 $\frac{7}{12}$	74 $\frac{1}{2}$
Females . . .	75 $\frac{1}{12}$	80 $\frac{8}{12}$	78 $\frac{8}{12}$	77 $\frac{1}{12}$
Total . . .	75 $\frac{1}{12}$	78 $\frac{1}{12}$	78 $\frac{8}{12}$	75 $\frac{1}{12}$

The greatest difference was between the mean age of the female subjects in Groups 1 and 2 respectively, but this difference was not statistically significant. (Student "t" test: $P > 0.10$.) Application of the analysis of variance test also showed that the eight groups of subjects (i.e., the four groups subdivided according to sex) came from a homogeneous population as far as their age was concerned (variance ratio = 1.187).

SOCIAL INTEGRATION.

Social integration is defined as the possession of "normal human contacts and the feeling of being a useful member of society" (Goldschmidt, 1946).

The criteria utilized as signs of positive integration were as follows:

1. If the husband and wife were living together.
2. If widowed and living with children or relatives.
3. If single, widowed, separated (legal or otherwise), or divorced, and they formed a harmonious part of the social unit in which they found themselves. (Excluded if living entirely alone.)

It should be added that, in common with the third sign of positive integration, the first two signs only applied if there was no evidence of disturbed interpersonal relationships.

Three categories of integration were formulated. They were:

1. Socially integrated. (As described in the preceding paragraphs.)
2. Limited integration. (The subject was tolerated by his children or others with whom he lived, but did not enter into the former's lives in any real sense or actual friction existed.)
3. Social integration lacking. (There was no evidence of signs of positive integration or limited integration.)

In Groups 2, 3, and 4 respectively the degree of integration present prior to admission to the Eventide Home, geriatric hospital, or mental hospital was investigated, whereas in Group 1 the current degree of integration was evaluated (Table II).

TABLE II.—*Degree of Social Integration.*

	Group 1.		Group 2.		Group 3.		Group 4.	
	Total No.	%.	Total No.	%.	Total No.	%.	Total No.	%.
Socially integrated . . .	12	50	7	29.2	10	41.7	10	41.7
Limited integration . . .	0	0	7	29.2	5	20.9	1	4.2
Integration lacking . . .	12	50	10	41.7	9	37.5	13	54.2

It will be seen that—

1. The control group contains the highest percentage of socially integrated subjects.
2. The smallest proportion of socially integrated subjects is found in the "Eventide Home" group.
3. Group 4 contains the highest percentage of subjects lacking social integration, but is followed closely by the control group.

Application of the χ^2 test, however, to a two-fold table of "socially integrated" v. "limited integration" plus "integration lacking" showed no significant difference between the groups ($P > 0.50$).

MARITAL STATUS.

The marital status of the four groups was examined. In Groups 2, 3 and 4 respectively the marital status prior to admission to the Eventide Home, geriatric

hospital and mental hospital was investigated, whereas in Group 1 the inquiry was directed towards the current marital status of the subjects (Table III).

TABLE III.—*Marital Status.*

	Group 1.		Group 2.		Group 3.		Group 4.	
	Total No.	%.	Total No.	%.	Total No.	%.	Total No.	%.
Married	6	25	0	0	5	20.8	4	16.7
Single	3	12.5	11	45.8	2	8.3	8	33.3
Widowed	14	58.3	11	45.8	15	62.5	11	45.8
Divorced or separated (legal and otherwise)	1	4.2	2	8.3	2	8.3	1	4.2

The table shows that—

1. Group 2 contains the highest percentage of single subjects and the lowest percentage (0 per cent.) of married subjects.

2. In all the four groups the largest proportion of subjects is to be found in the "widowed" category. Though Group 4, therefore, contains a high percentage of widowed subjects, in the samples investigated the other groups contain an equally large—and even larger—proportion of subjects in the widowed category.

Comparing Groups 2, 3 and 4 respectively with the control group on a two-fold table of married subjects *v.* other categories combined, the only significant difference was between Groups 1 and 2 (exact probability method of χ^2 , $P = 0.01$). Similarly, on a table of single subjects *v.* other categories combined, the difference between Groups 1 and 2 was the only significant one ($P = 0.01$).

PREVIOUS OCCUPATION.

(a) Interval between ceasing regular work, and—

Present (Group 1).

Admission (Groups 2 and 3).

Overt Breakdown (Group 4).

The hypothesis has frequently been put forward that the termination of active work in later life leads to impaired physical and mental health (e.g. Lawton, 1942). It was therefore decided to test the validity of this hypothesis in the groups constituting the material of the present study. (Table IV.)

It should be added that, for the purpose of this inquiry, the "housework" of female subjects was assessed as "regular work," the proviso being made that there must have been sufficient work to have occupied the subject on a "full-time" basis.

It will be seen that Groups 2, 3 and 4 each contain a larger proportion of subjects in the longer time intervals (i.e., those "over 1 year") than Group 1. Application of the χ^2 test on the basis of a two-fold table of "under 1 year" *v.* "over 1 year" showed that the differences between Groups 1 and 2 ($P < 0.01$) and between Groups 1 and 3 ($P < 0.01$) were significant, but that the difference between Groups 1 and 4—though marked—just failed to reach significance ($P > 0.05$). (It may be stated that it seems highly likely that, with larger sampling, a significant difference could be demonstrated between Groups 1 and 4.)

Taking all the four groups together, the difference between the proportion of women in the "less than 1 year" category (50 per cent.) and the proportion of men (22.9 per cent.) is significant (Difference/S.E. = 2.8). This statistically significant preponderance of women in the short time interval category is probably due to the fact that they tend to continue at their routine housework longer (i.e., till they have reached a more advanced age) than men are able to remain engaged in their regular employment.

(b) Interests—

At Present (Group 1).

Prior to Admission (Groups 2 and 3).

Prior to Overt Breakdown (Group 4).

On the basis of the theory that to maintain mental health all individuals should continue to have some positive interests throughout their lives, the interests of the four groups of subjects were investigated (Table V).

TABLE IV.—Interval between Ceasing Regular Work and—
Present (Group 1).
Admission (Groups 2 and 3).
Breakdown (Group 4).

	Group 1.						Group 2.					
	M.		F.		Total.		M.		F.		Total.	
	No.	%.	No.	%.	No.	%.	No.	%.	No.	%.	No.	%.
Less than 1 year .	5	20.8	11	45.8	16	66.7	3	12.5	3	12.5	6	25
1 to 3 years .	1	4.2	0	0	1	4.2	4	16.7	1	4.2	5	20.8
Over 3 years .	6	25	1	4.2	7	29.2	5	20.8	8	33.3	13	54.2
	Group 3.						Group 4.					
	M.		F.		Total.		M.		F.		Total.	
	No.	%.	No.	%.	No.	%.	No.	%.	No.	%.	No.	%.
Less than 1 year .	1	4.2	3	12.5	4	16.7	2	8.3	7	29.2	9	37.5
1 to 3 years .	2	8.3	3	12.5	5	20.8	5	20.8	1	4.2	6	25
Over 3 years .	9	37.5	6	25	15	62.5	5	20.8	4	16.7	9	37.5

TABLE V.—*Interests.*

Group 1 (At present).					Group 2 (Prior to admission).					
M.		F.		Total.	M.		F.		Total.	
No.	%.	No.	%.	No. %.	No.	%.	No.	%.	No. %.	
Marked	.	.	.	.	9	37.5	10	41.7	19	79.2
Present	.	.	.	.	1	4.2	2	8.3	3	12.5
Absent	.	.	.	.	2	8.3	0	0	2	8.3
Group 3 (Prior to admission).					Group 4 (Prior to breakdown).					
M.		F.		Total.	M.		F.		Total.	
No.	%.	No.	%.	No. %.	No.	%.	No.	%.	No. %.	
Marked	.	.	.	.	6	25	7	29.2	13	54.2
Present	.	.	.	.	1	4.2	2	8.3	3	12.5
Absent	.	.	.	.	5	20.8	3	12.5	8	33.3

Key to Table.—Marked : more than one interest.

Present : only one interest.

Absent : no interests.

The interests included, for example, being active in a club, attending sporting events at regular intervals, or hobbies, such as woodwork or gardening. In addition, if a subject was still actively engaged in regular work, he was scored as having "marked" interests (i.e., there was evidence of marked activity), and it is this "activity," this interest in life, this persistent tendency to extraversion, which constituted the essence of the factor under investigation.

It will be seen that there is a regression from Group 1 to Group 4 in the proportion of subjects with marked interests, and the χ^2 test, applied to a two-fold table of "interests marked" *v.* "interests present" and "interests absent" combined, shows that this distribution is statistically significant ($P < 0.01$). The findings, therefore, offer support for the hypothesis that the maintenance of positive interests in later life militates against the development of mental—and physical—ill-health.

AWARENESS OF AGEING.

Subjective awareness of ageing was investigated in the four groups. Each subject was asked, "At what age did you notice for the first time that you were getting old?" The average ages and age ranges are shown in Table VI.

TABLE VI.—*Age of Feeling Old.*

	Males.		Females.		Whole group.	
	Average age.	Range.	Average age.	Range.	Average age.	Range.
Group 1	61	50-73	67	55-83	64	50-83
Group 2	61	50-85	71	50-88	66	50-88
Group 3	65	45-72	69	60-81	67	45-81
Group 4	63	50-70	66	55-75	65	50-75

The variation between the groups of the mean age of feeling old is no more than could have arisen by chance alone. (Analysis of variance test: variance ratio = 1.8822). Taking each sex separately, however, and calculating the mean age of feeling old for all the groups combined, there is a significant difference between the sexes (difference/S.E. = 2.61). In other words (see Table VI), the mean age of feeling old for the females is significantly higher than for the males.

DISCUSSION.

The difficulties involved in assessing the degree of social integration in old people have been referred to by Sheldon (1948) and Post (1951). "It is plainly insufficient," states Post, "to assess the degree of social integration solely on the basis of marital and domestic status, as had to be done in the present study; an old person who is living within the family circle but is neglected may in actual fact feel much more lonely than one who lives alone but is frequently and regularly visited by his friends." An attempt has therefore been made in this investigation to extend the definition of social integration employed by Goldschmidt (1946). She states, "Social integration was taken to have been achieved in cases in which at the time of the onset of the mental illness husband and wife were living together, or if widowed, they lived with children or relatives." Forming "part of the unit in which they found themselves" was only regarded as evidence of positive social integration in the case of single women and men. In the present study, however, subjects who were single, widowed, separated (legal or otherwise) or divorced were all regarded as socially integrated if they formed a harmonious part of the social unit in which they found themselves. In addition, whereas Goldschmidt considered that a subject was integrated to a limited extent if he was tolerated by his children with whom he lived, in the present investigation "limited integration" was regarded as being present if the subject was tolerated not solely by his children, but, alternatively, by others with whom he may have lived. This broader conception of social integration may have been responsible for the higher percentage of subjects in mental hospital who were regarded as socially integrated (41.7 per cent.), compared with that reported by Goldschmidt (1946) in her survey of patients in a mental hospital for the aged (20 per cent. of the women patients and 28 per cent. of the men patients were assessed as socially integrated).

The small difference between the percentage of subjects in Groups 1 and 4 respectively—as far as the three categories of social integration are concerned—would appear to be related to Post's observation (1951) that the social status of patients admitted to a psychiatric observation unit direct from their homes differed little from that of a normal (control) group studied by the Rowntree Committee (1947). The proportion of Post's socially isolated patients only became strikingly higher than that found in the control group when subjects admitted to the observation unit from institutions were included in the comparison. This latter observation is supported by the fact that, in the present investigation, the "Eventide Home" group (Group 2) contained the smallest proportion of socially integrated subjects (29.2 per cent.).

Post (1951) states that his patients admitted to an observation unit contained a smaller proportion in the married state and a larger proportion in the widowed category than was found in a control population. However, Curran *et al.* (1946), investigating the marital status of a group of old people who were not in hospital, also found that "the most remarkable feature is the high percentage of widows." In addition, Affleck (1947), surveying 788 cases in the chronic sick wards of five hospitals, found a high proportion in each sex of both widowed and single patients. The present study would appear to provide a connecting link for many of these apparently diverse findings. In this investigation it has been shown that in the four groups studied—normal controls, Eventide Home residents, geriatric hospital patients, and mental hospital patients—the highest proportion of subjects in each case was in the widowed category (58.3, 45.8, 62.5 and 45.8 per cent. respectively). The only statistically significant finding was the high proportion of single subjects in the Eventide Homes compared with that found in the normal control population.

Post (1951) says that his findings on patients admitted to an observation unit fit in well with Sheldon's finding (1948) that mental impairment amongst elderly people is positively correlated with the widowed state. It must be added, however, that Sheldon's observation concerning widowed subjects referred specifically to those suffering from only slight mental impairment, his percentage of widowed in the latter category (63.4 per cent.) being almost equivalent to that found in a similar clinical group in the present study (Group 3, 62.5 per cent. widowed). In subjects with more severe grades of mental impairment (i.e., with clinical syndromes similar to those likely to be found in an observation unit), the proportion of widowed found by Sheldon was only 35.7 per cent., this being actually less than the percentage of widowed subjects found in the whole of his random sample of old people (44.6 per cent.).

The view that prolonged inactivity following the cessation of regular work is conducive to mental and physical ill-health receives support from the present study. It was found that in Groups 2 and 3 respectively there was a statistically significant larger proportion of subjects in the longer periods of inactivity (following the cessation of regular work) than in the control group, and a similar larger proportion of subjects in Group 4 (compared with the control group) only just failed to reach significance. Passing from Group 1 to Group 4, there was a progressive decline in the proportion of subjects who had cultivated marked positive interests, and the differences involved were significant.

Many workers have commented on the difference between the sexes as far as the age of retirement from regular, active work is concerned (e.g., Lawton, 1942; Cameron, 1945), and their observations receive support from the present study. It was found that, taking all the groups together, there was a higher percentage of women in the shortest time interval following the cessation of regular work (compared with the proportion of men in this category), and this difference between the sexes was statistically significant. The position is summed up by George Lawton (1942) who states, "... the sudden stoppage of work is one of the most important explanations for the fact that men, in the post-retirement years at least, are apt to exhibit more symptoms of ageing, both psychic and somatic, than do women." In addition, it has been shown that women feel old at a significantly higher age than men, and this finding, taken in conjunction with the finding immediately preceding, provides supportive evidence for the hypothesis that women become liable to symptoms of ageing at a higher age than is the case with men as a result of the fact that they are much less likely to be compulsorily retired from their regular work.

SUMMARY AND CONCLUSIONS.

Four groups of subject who were not less than age 65 were studied. They included a normal, control group of subjects living in their own homes, residents in Eventide Homes, patients in a geriatric hospital, and patients in a mental hospital. The groups were suitably matched for age, sex, and socio-economic status, and, in addition, a measure of selection was applied.

No evidence was provided of any significant difference between the four groups of subjects studied in the degree to which they were considered to be socially integrated. The small difference discovered between the degree of social integration in the control group and "mental hospital" group respectively, and the fact that the "Eventide Home" group contained the smallest proportion of socially integrated subjects, was considered to be related to, if not in direct support of, Post's finding (1951) that the proportion of socially isolated individuals among aged psychiatric patients only becomes strikingly higher than that of a normal, control population when subjects admitted from such institutions as Eventide Homes are included in the comparison.

In all the four groups the highest proportion of subjects were widowed, and this finding provides a connecting link for many of the apparently diverse observations reported by other investigators.

Evidence has been provided in support of the view that prolonged inactivity following the cessation of regular work, and the absence of marked positive interests in later life, are conducive to mental—and physical—ill-health in the aged.

There was supportive evidence for the hypothesis that women become liable to symptoms of ageing at a higher age than is the case with men as a result of the fact that they are much less likely to be compulsorily retired from their regular work.

It would be of value to conduct further research on much larger samples along the lines indicated by the positive findings that have emerged from this study.

The material for this paper has been abstracted, with some modification, from parts of a thesis submitted to the University of Leeds for the degree of M.D. I wish to express my thanks to Dr. J. S. Harris, Physician-Superintendent, Claybury Hospital, for permission to utilize the clinical material and case-notes of the hospital, and for the encouragement received whilst this investigation was being carried out. My thanks are also due to Dr. J. DeLargy, Senior Medical Officer, Langthorne Hospital, for allowing me access to the clinical material and records of the hospital; to Dr. W. J. Martin, Statistical Research Unit (Medical Research Council), London School of Hygiene and Tropical Medicine, for advising me on the statistical treatment of the findings; and to the Salvation Army authorities for permission to visit their Eventide Homes and interview a number of the residents.

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SOME PATHOLOGICAL PROCESSES SET IN TRAIN BY EARLY MOTHER-CHILD SEPARATION.*

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It is characteristic of mental ill-health that the individual's capacity to make continuous co-operative relations with others is impaired. In the psychoses and psychopathic conditions this is unmistakable; in the neuroses it is sometimes less so, and there are even neurotic patients who seem to be especially kind and co-operative. But we know that they only achieve this behaviour at great cost of effort, anxiety and guilt and that, if they break down, they can be very hostile and withdrawn.

This disability in the function of making continuous co-operative relations is often patchy. A man may be a tolerably good employee but an impossible husband; a girl may be easy to manage at school but jealous and difficult at home. It is clearly in the field of love relations that the disability is most common and most serious. It is in these relations that a person's most powerful instincts and deepest feelings are involved—oral and sexual demands, loving drives toward giving care and protection, hating drives toward violence and destruction—and it is on whether or not these relations develop favourably that he is happy or unhappy, mentally well or mentally ill.

Whilst this disability in making relations with love objects may sometimes be secondary to organic brain damage, we know that in many cases it is due to the capacity itself having been deranged by the particular experiences with his love objects which the individual has had in his earliest years. A very large range of psychiatric disorders seem to spring from or be reactions to ambivalent feelings for the love object. Thus, when repressions and defences are stripped away, the patient is seen as someone who is at one moment devoured by his need for a love object and the next overwhelmed by hatred of it. The extent to which these incompatible drives are unconscious varies, but it is usual for both to be unconscious in some degree. Often, of course, it is mainly the hostility which is unconscious, and our task is to help the patient recognize and integrate it into his character instead of it remaining an underground, uncontrolled and alien force. This condition is now so well known that we find almost every beginner in child guidance coming armed with these concepts. The opposite is much less well recognized—that in which the patient is at least partly conscious of his hatred but unaware of his love. This is exemplified by the misogynist who maintains he has no use for women, and the psychopath who scornfully disclaims all desire for love relations. Both are living their lives in a mood of "sour grapes," a mood which so tragically prevents them ever getting what they most desire—and need.

The study of personality and its deviations in terms of relations with love objects has for long been the concern of psychoanalysts; the central importance of the conflict of hating the loved object, and the intolerable depression and anxiety which this arouses, has been stressed especially by Klein (1948).

It is my intention in this paper to discuss one class of experience which gives rise to these acute conflicts in love relations—that of early mother-child separation. First, I shall describe briefly the treatment of an eleven-year-old boy who had developed intensely ambivalent love relations following several separations; then I shall give a short account of some observations on the responses of young children to their mothers during and after a separation experience; and, finally, I shall raise some theoretical questions as to why experiences of this kind can have such far-reaching results.

I am indebted to Mrs. Yana Popper for the following case-record:

* The Chairman's Address at the Meeting of the Child Psychiatry Section at the Annual Meeting of the Royal Medico-Psychological Association at Northampton, July, 1952.

Desmond was referred to the Clinic by the School Care Committee at the age of eleven for truanting from school, wandering from home and petty stealing. The referral followed his stealing the shoe of an older girl—an episode which was judged both curious and ominous. His school teacher was especially concerned because he was so obviously unhappy. She reported him as restless and inattentive, having no special friends and inclined to be quarrelsome.

At home his behaviour was similar. He quickly got tired of what he was doing and also tired of his friends. Mostly he mixed with girls and younger children. He had also made acquaintance with a man whom his parents regarded as undesirable. Neither of his parents felt they had much contact with him, and both were worried that he was so secretive and evasive about what he had been doing. He had taken small sums of money at home; he had also had spasms of wetting the bed.

Desmond had a serious history of separation:

Soon after his birth his mother developed cancer of the breast. Although Desmond was cared for by her until she died when he was 15 months old, these first 15 months were interrupted by mother's treatment in hospital and by her increasing weakness towards the end. For the next 12 months (15 months to 2 years and 4 months) he was with one maternal aunt, and then for another 12 months (2 years 4 months to 3 years 4 months) with a second maternal aunt. With both aunts there was difficulty over toilet training, and it was said that the second had been strict about this to the point of cruelty. At 3 years 4 months there was a third change, this time to a paternal aunt with whom he stayed about 19 months. Finally, one month before his fifth birthday he returned to his father, who had remarried. The step-mother was thus his fifth mother-figure.

Both father and step-mother were very troubled about Desmond, felt unable to manage him and advocated a boarding school. Step-mother, who was a simple middle-aged woman, had little understanding of Desmond and, although well-meaning, was inclined to nag him. Father, an elderly and withdrawn van-driver, had rather more insight and was sometimes critical of his wife's attitude. But, although he had sympathy for Desmond, there seemed little contact between father and son. At the time of referral, therefore, Desmond's home life was far from happy. However, this was not judged to be the major problem. Consideration of all the evidence led to the opinion that Desmond had a very serious disability in his capacity to make relationships, and that diagnostically he was not far removed from the affectionless thief.

He was thus a very doubtful proposition for treatment. It happened, however, that he lived close to the Clinic, and that there was a vacancy for him to be seen four times a week. After debate a decision to treat him was taken.

He was a thin-built boy with brown eyes and a pale sensitive face. He was rather dirty in appearance and often came to the Clinic with his clothes torn; but this should not be held against his step-mother, as he came after school hours and lots of things happened to him and his clothes in the course of the school day. On account of his high I.Q. (at least 137) he should have got into a Grammar School, but in the selection examinations he had come out in the top group of Secondary Modern children. His interests were varied; he had plenty of acquaintances (though no friends) and he was leader of a local gang. He made many swops at school, and things he could not swop he tended to acquire "by findings" them. As his step-mother put it, he tended to find things before people had lost them.

Treatment, which began a month before the summer holidays, started with a period of testing and trying out the therapist. He did not seem to trust her, nor did it seem that he trusted anyone else. Though there was every indication that he wanted a warm relationship very badly, he seemed to make a point of keeping outside it. If we piece together Desmond's remarks from a number of his earlier sessions they sound like this: "I would like to be liked—they like me only when I'm a good boy; I cannot be a good boy, not very often anyhow. I am getting worried about it. I better keep out."

Desmond was very talented, and produced pictures and stories with great ease. His first drawings and paintings were of far-away people—Eskimos, Chinese, Red Indians. Usually the figures in a picture were quite isolated from each other; but if they did get into contact, then there was murder. This mood is illustrated in one of his little poems:

"Put another nickel in old Charley's treacle tin.
When he plays his violin it's music, music.
When he gets a nickel in, in his little treacle tin,
He'll go to the Odeon and see Roy Rodgers shooting.
When he is shooting, shooting be sure that death is near.
An when he is shooting, shooting it's murder, murder, murder."

For the early weeks he persisted in his detached attitude—the quiet before the storm. Then it all happened as he had himself prophesied: the therapist ceased to be a nondescript person and he ceased to be at a distance. Even before the summer holidays his feelings had become entangled, for immediately after it he had outbursts of the most violent physical aggression. In this there were three main themes—first, anger at the therapist deserting him during the holiday, secondly, jealousy of another child patient and finally, jealousy of the twin babies his step-mother was expecting in October. Although at times

his mood was kindly, more often it was violent: he tried to set the therapist's chair on fire, to burn her hair and stockings and to strangle her. Once when throwing sand about he shouted, "that's for you, for Mummy, for the babies and for Daddy. I'll kill you all with bombs."

When in mid-October his step-mother went into hospital for her confinement, he remarked "She doesn't care about me—she didn't tell me what the meat costs and what the bacon costs. She just left us like that." The fortnight after the twins were born was a disturbed period with outbursts of extreme violence alternating with a new type of behaviour—lying on the floor sucking his thumb. Evidently his own intense need for mothering had been aroused and with it violent jealousy. The babyish behaviour increased. For hours he would lie sucking his thumb and talking baby things, or he pretended he was a Sheik who could not speak English. Occasionally, now, there was concern for the therapist. Following a session which she missed because of a cold he was worried about her health, and later he tied himself up to stop himself being dangerous. Gradually he adopted the therapist as his over-idealized mother. He had a portrait of his own mother at home and he claimed a resemblance between the two. His step-mother became "the mother who looks after me, but not like you." Thus the step-mother was left to the twins whilst his therapist belonged to him alone. One day he thought he had seen flying saucers, which he explained were breasts sent from Venus for his therapist and himself. Fortunately, this intense love relationship with the therapist permitted him to be kind both to his step-mother and the twins.

As the therapeutic process progressed in subsequent months, Desmond was able to recognize some of the truth regarding his intense ambivalence towards his love object. For instance when she had an Easter holiday 6 months after the twins' birth he presented her with two little poems. One ran:

" Oh my little darling I love you,
Oh my little darling I don't believe you do.
If you really loved me as you say you do
You would not go to America and leave me at the Zoo."

This same theme of being unloved, deserted and rejected emerged in the other poem, which provides dramatic evidence of his feelings during the repeated separations of his early childhood:

" Jumbo had a baby dressed in green,
wrapped it up in paper and sent it to the Queen.
The Queen did not like it because it was too fat;
She cut it up in pieces and gave it to the cat.
The cat did not like it because it was too thin,
She cut it up in pieces and gave it to the King.
The King did not like it because he was too slow,
Threw it out the window and gave it to the crow."

Unfortunately, after 12 months, treatment came to a rather abrupt end. From the first it had seemed probable that later on Desmond would be best in a boarding school: he wanted to become a sailor and to go to a training school for this purpose. The L.E.A. had been informed, and when a vacancy was suddenly offered it was thought unwise not to accept it. This decision to discontinue treatment was also influenced by the fact that the twins, now 9 months old, had become so much the centre of the household that there was little time left for Desmond.

Desmond responded to this decision in a way which was typical of him. At first he was very pleased and excited about his new shoes and suits and so on, but when the time to go came nearer he became angry with his therapist for her rejection of him. Once he even came with a razor he had "found" and said he would pay her back and cut her open. He then got very frightened of himself and for about a week would not stay alone with her in her room, but had to bring a friend along with him. For the last interviews before his departure he was depressed and loving and wanted to make sure that she would be available for him at any time. The final week he came virtually at any time of the day, burst into her room and was very disappointed if she was with somebody else. When he finally left he said he would write to her, and it was arranged that he should come and see her again during his first vacation at Christmas. In fact, he wrote only one letter, which was typically Desmond. It started off with telling her that he had not written before because he had forgotten her, and ended with an urgent appeal for her to see him as soon as possible.

She saw him twice during these holidays. The first time he was very excited and tried to control himself; he spoke about school and school affairs. The second time in a rather pathetic way and with great insight he talked about the various stages of his treatment. He remarked, "You always knew when I was unhappy." He talked about home, his parents and the twins, and showed a realistic attitude towards his difficulties in the family. He then asked for one great favour—to be given her pencil, which he wanted to take back to school with him. When he got the pencil he wrote something on a piece of paper, folded it, put it into her hand and rushed out. On it was written, "Pugno et amo."

This case illustrates vividly the intense ambivalence—the intense longing for a love object and the intense hatred of it when it frustrates—which underlies an aloof and secretive exterior. Though he seeks love-objects he has great difficulty in maintaining contact when he has one. This is due both to his expectation of rejection, and to his fear of the murderous impulses which he knows will surge within him if he does.

This boy's ability to make continuous co-operative relations was clearly most severely impaired. (Had he received no treatment he would almost certainly have been diagnosed a psychopath in later life, and it is evident that this danger is by no means yet over.) Equally clearly the disability is associated with the extreme strength of his impulses of love and hate for love-objects and to his inability to control these impulses. So much will be readily agreed, but there may be some debate when we come to consider the origin of this state of affairs. Few child psychiatrists will doubt that, whether or not hereditary factors played a part, a vital influence has been his experience of a succession of rejections by mother figures during his first five years. In fact the connection between this type of character and these experiences can now be regarded as well established. (Bowlby, 1951). We can therefore be reasonably sure that, had this boy had a continuous and loving relationship with one mother figure during these early years, he would not have grown up to be torn by these conflicting impulses and emotions.

The research team for which I am responsible at the Tavistock Clinic is now concentrating its attention on the ways in which these powerful, savage and disruptive forces are set in train by the experience of early mother-child separation. We are at present analysing such data as we have on how very young children respond to this experience, and are planning next year to collect more data in a far more systematic way.

In addition to trying to understand what emotional responses are stimulated by these experiences and how they progress, we are concerned to analyse the effects on these responses of the many relevant variables such as the child's age, the length of his separation, the character of the mother-child relationship before and after it, the quality of substitute mothering, if any, during it, and other more subtle influences. Because such data are unobtainable in exact and reliable form unless studied at the time of separation, we are undertaking projects which concentrate on first hand observations of the child's behaviour during the course of a separation experience and of the details of the experience itself. As regards Desmond we shall never know precisely what experiences he had, and we therefore do not believe it to be fruitful in future to use such cases for research on the problem.

During the past four years observations on a number of young children undergoing separation experiences have been recorded by Mr. James Robertson, and these are now being analysed by Mrs. Mary Ainsworth with Mr. Robertson's assistance. It is possible to present a brief résumé of some of their findings; their relevance to the clinical problem presented by Desmond will at once be evident.

The sample of 49 cases on which our observations happen to have been made is rather heterogeneous. All except three of the children were aged between 12 and 48 months at the time of separation—the exceptions were one of 4 months, one of 11 months, and one of 4 years 4 months. This age-range conforms with our plan to study children who have already matured to the point of making a specific and consolidated relationship with a discriminated love object, but who are not yet matured sufficiently to be able to maintain this love relationship in the absence of the object. Because the process of achieving such a consolidated relationship is gradual and because the age at which it is achieved probably varies greatly in different children we have decided to concentrate on children of over 12 months of age and under 4 years.

The situations in which these children were observed were—

Residential nursery	.	.	.	.	25
Fever hospital	.	.	.	.	13
Sanatorium	.	.	.	.	9
General hospital	.	.	.	.	2
					—
Total	.	.	.	.	49
					—

FRETTING.

There were 45 children whose *initial responses* were observed: all but three of them fretted. This was either acute, characterized by crying of varying degrees

of violence, continuousness and duration, or else subdued, with whining, grizzling and generally subdued behaviour. Children who could speak cried or muttered "I want my mummy" with varying degrees of insistence. Few can doubt that a demand for their mother's presence is the main impulse possessing these children. Other features are a lack of responsiveness to other people, a greedy appetite following a brief lack of it, restless nights, and a loss of control of bladder and sometimes also of bowels when these have been established.

Two children who were left in a good residential nursery and who represent the two extremes of our age-range illustrate acute fretting.

Lucy L—, aged 1 $\frac{3}{4}$.—Lucy was very upset on admission and cried violently. She would not eat or drink. Before going to sleep she cried bitterly for a long time, although she enjoyed her bath before bed-time. Next morning she was subdued. Throughout the day she cried a lot, except when eating or when the nurse talked to her. She was upset whenever the nurse left the room, and was still upset at bed-time. On the third day she was better but still cried and grizzled a lot.

Yolande M—, aged 4 $\frac{1}{2}$.—Yolande cried when her father left her at the nursery, and all during tea-time. She refused to eat. The rest of the day she was withdrawn, showing no interest in the staff, but clung to her younger brother. She sucked her thumb, and played a little, but broke off crying every now and then. She cried a long time before going to sleep, calling for her mother and father. On the second day she was subdued, and cried only when taken out for a walk. She showed somewhat more interest in the staff of the nursery, but did not seek attention from them. She played a lot with her brother. Before going to sleep she again cried loud and long, calling for her parents. By the third day she seemed in much better spirits and did not cry.

Two other residential nursery children illustrate subdued fretting:

Cecily R—, aged 2 $\frac{1}{2}$.—Cecily did not cry when her father left, nor did she cry at bed-time or call for her parents. She was quiet, played by herself and showed no interest in anyone. She seemed a little happier the second day, but was still very quiet, shy and unresponsive. On the third day she was still very shy and seemed to be highly conforming. Her play was restricted and dreamy. She talked a lot of her mother and father. Twice during the day she wet, although she had been reported as fully trained. On the tenth day she was still quiet and solitary. She still talked a great deal about her parents and spent most of her time looking out of the window as though watching for them. By the seventeenth day she was more active, but still quiet. The staff said she was "a sweet child, and no trouble."

Jonathan S—, aged 2.—Jonathan was admitted sucking an ice-lolly which he refused to part with. He did not cry or ask for his parents. However, he fought furiously against being undressed and bathed. On the second day he seemed dejected and solitary, spoke a lot of "mummy" and the new baby. He kept looking for daddy, and seemed to be living through some phantasy about his family that he could express but incoherently. He was described as quiet and depressed.

All four were ordinary children from ordinary homes in the nursery for a few weeks whilst their mothers had a new baby.

Analysis of the records shows that acute fretting was more common in the hospital settings than that of the nursery (14 cases out of 19 children who fretted against 6 out of 23). This does not seem to be related to the degree of the child's illness. We are inclined to believe it to be due to two factors—(i) the strange and sometimes painful medical attention which frightens them, and (ii) their being confined to their cots. It was noteworthy that when nursery children were confined to their cots they cried more, whilst hospital children allowed up cried less.

The length of time a child frets varies enormously—in our series from one or two days to 17 days. Our observations hardly permit us even to guess what factors are operating here. Age seems to play little part (at least within the range of 1 to 4 years represented here) but the presence of a substitute mother almost certainly shortens the phase. No doubt events at home and the interpretation the child puts on the separation are extremely important.

RESPONSE TO PARENTS' VISITS.

Despite almost all these children living for many days in a state of strong need of mother, it is characteristic of them that they cannot greet her when she visits. The following three children were visited in a sanatorium soon after arrival:

Janet B—, aged $2\frac{1}{2}$.—On the third day Janet was visited by both parents. She turned away from them and sobbed. When the visit was over she again became very distressed, clung to her father and had to be disengaged by force. When visited again on the sixth day she was very upset and screamed.

Betty D—, aged $1\frac{1}{2}$.—When visited on the 11th day she saw her father first and cried loudly. When both parents entered the cubicle she screamed "Mummy! take me!" She was fretful throughout the $1\frac{1}{2}$ -hour visit and made a great fuss when they left.

Mervyn B—, aged $1\frac{7}{12}$.—Mervyn was visited by his mother on the 8th day. He cried both when she came and when she left, although he was otherwise quiet and placid throughout the visit. This pattern lasted for 5 weeks, after which he ceased crying when she arrived, but cried upon her departure.

During the phase of fretting the initial response to the mother's visit is to cry and perhaps to turn away. The likelihood of this being due to the child's longing for his mother being suffused with hatred of her seems high. This, we believe, is the beginning of that disruption of the capacity to make love relations which we saw in Desmond.

DENIAL OF NEED FOR LOVE RELATIONSHIP.

After a few weeks of separation this disruption is commonly carried a stage further in that many children show little overt need of love relationships. This response seems to be especially frequent in children who have no regular mother substitute. Our records show a number of such children, the majority of them hospital children. In general they are indifferent in conversations about their parents. When visited they are disturbed neither at the beginning nor at the end of the visit. They show no affection to their mothers during it, and do not respond to an affectionate approach from her. They are superficially responsive to friendly advances from other adults, but they do not discriminate between substitute figures, and do not seek affectionate relationships with any of them. Often they appear happy, bright and friendly and they are usually hyperactive.

An example was Roddy H—, who contracted T.B. at 15 months and, after being for 3 months in a hospital, was transferred to the sanatorium. At the age of $3\frac{1}{2}$ years, after having been there 2 years, he talked a bit about his mother, but only to comment about the likelihood of her coming on visiting day. During her visits he showed her no affection, did not respond to her cuddling, and occasionally told her "You can go now": he seemed more interested in the toys she brought than in her. He was very friendly with the staff and was a favourite, although he had formed no particular attachments. Although he seemed to be cheerful, he was easily upset; the slightest tap threw him into tears and he threw himself down in a tantrum; however, he could be tickled out of these tantrums. Occasionally he was mute and subdued rather than bright, active and friendly. He had no eating, sleeping or elimination problems.

All the children in this state of whom we have records showed no particular response to their mothers when they visited. Continued contact with Roddy H— and periodical investigation with Rorschach and the Children's Apperception Test showed this rupture of his emotional relation to his mother to persist for at least $2\frac{1}{2}$ years after his return home (Ainsworth and Boston, 1952).

Underlying this lack of response to love objects there appeared to be much hatred. Several were said to attack other children without provocation and to be especially destructive of toys. In future more systematic attention will be given to this aspect of their behaviour.

Though the data are not fully analysed, there is strong reason to believe that a tendency to withdraw interest in a love relation or to exhibit intense degrees of hostility to possible love objects is especially common when a child has had more than one separation experience, which sometimes happens with sick children who are moved from hospital to hospital or ward to ward and may also occur if a child loses his mother. The case of Desmond, who had five mother-figures in the same number of years, is almost certainly an example of this.

THEORETICAL PROBLEMS.

These descriptions make it plain that when a young child is separated from his mother very powerful emotional forces are generated and the child is thrown into a state of acute stress. Although these facts have for long been well known to

those caring for separated children, their relevance to psychiatry has not hitherto been appreciated. But even though we can now be reasonably sure that it is experiences such as these which can set in train the uncontrollable and contradictory impulses which haunt the psychopathic and neurotic character, we are still left with a fundamental problem: Why is it that these violent emotional responses when they occur in early childhood so affect personality development that the person concerned is prone to respond in these same violent ways throughout his life? In other words, why are the effects of these experiences so persistent? In attempting to answer this question several features need to be taken into account.

First, it will be asked, are not some children so endowed by heredity that they are more easily and more permanently disturbed by these experiences than are others? It seems probable that this is so. It squares with our clinical experience, and in this connection it might be of importance that Desmond's maternal grandmother was psychotic in her later years. Clinical experience in this matter, however, is notoriously unreliable, and my own opinion is greatly influenced by the more systematic observations of the zoologists and experimental psychologists. For instance, both Lorenz (1952) and Scott (1950) have shown that dogs of different breeds behave very differently when their love relationships are interfered with.

Secondly, we must consider the effect on outcome of different ways of treating the separated child. Our records suggest that this is of the greatest importance. For instance, it would appear that the child who in addition to the experience of separation suffers a lack of ordinary care and attention is especially liable to develop hostile and destructive behaviour of the kind shown by Desmond, who is himself believed to have been ill-treated by one of the aunts who cared for him. This evil combination of separation with rejection is apt to occur rather frequently—for two quite different reasons. First, for obvious reasons the unloving mother is especially likely to part with her child (though it would be a gross travesty to assume as is sometimes done that every mother who parts with her child is unloving). Secondly, the separated child is not easy to love—a fact of the utmost importance. When fretting for his mother he tends to reject the kindly nurse who seeks to comfort him and, later, if he becomes attached to a mother substitute, his attachment is often of such a greedy and jealous character that he hardly endears himself to her. Similarly, his behaviour on return to his mother is not calculated to make things easy for her. Most mothers find their children's failure to recognize them and to respond, or their outright rejection of them, on reunion extremely hard to bear, and later, when feelings have thawed, their intense possessiveness and whining mummyishness tries patience to the limit. Events such as these set up vicious circles which undoubtedly play an important part in establishing adverse patterns of behaviour in the personality, thereby more or less permanently crippling the capacity to make satisfying love relationships. Remembering these facts we must be charitable in judging the behaviour of nurses, mothers and step-mothers who have the care of children who have experienced separation.

Though it seems likely that these two factors—differential susceptibility of an inherited kind, and vicious circles in relationships stimulated by the children themselves—play a significant part in determining the development of neurotic and psychopathic characters, the circumstances in which these ambivalent and withdrawal responses are first learnt have certain special characteristics, which we believe account for their relative indelibility. These are three in number:

(a) The organism is very immature and full cerebral structure and function far from present.

(b) The capacity to make love relationships is in course of extremely rapid development and basic patterns of response to love objects being learnt. This is a period when a function is at its most vulnerable to the influence of trauma—in embryological terms the critical period—when it is likely that what is learnt will be especially persistent.

(c) These responses are learnt in a situation of stress which can be defined as a situation in which the solution of a task is difficult or impossible, but motivation so high that withdrawal is not acceptable to the organism. Such experimental work as exists suggests that responses learnt under stress are far more resistant to extinction than those learnt when the organism is relaxed (Maier, 1949; Fuller, 1950; Scott, Fredericson and Fuller, 1951), and that exposure to one stress situation has significant effects on later reaction to another by lowering the threshold of susceptibility (Russell, 1952).

Thus we find ourselves confronted with the laws governing initial learning by immature organisms in conditions of stress. Unfortunately the overwhelming majority of experiments in the field of learning study exactly the opposite state of affairs—the laws governing later learning in mature organisms, not in conditions of stress. It is evident, therefore, that if learning theory is to help us with these central problems of psychopathology, it will need to be extended to cover the special conditions described. Such an extension is greatly to be desired, since it seems likely that it will establish the link between human psychopathology and studies of experimental neurosis. The Tavistock research team has become greatly interested in these prospects, and Mr. Rudolph Schaffer, to whom I am much indebted for many of these ideas, is giving them special attention.

The data and the ideas which I have described have accumulated within the team in the past four years. It is our belief that they are concerned with some of the central problems in psychopathology, and that when all these matters are clearly understood our knowledge of psychopathology will be greatly clarified and deepened, and with it our capacity enhanced to cure and, above all, to prevent many very prevalent forms of psychiatric illness.

SUMMARY.

1. Much mental ill-health is usefully regarded as a disability of the patient in his capacity to make relations with love objects. Feelings of hatred towards a love object result in acute conflict.
2. The separation of a young child from his mother, especially if repeated, is liable to produce this state of affairs. The case of a boy of eleven is described illustrating this connection.
3. Some observations on 49 young children separated from their mothers under the age of $4\frac{1}{2}$ years are presented, with particular reference to fretting, responses to parents' visits and denial of the need for a love relationship.
4. The psychodynamic problem of why separation experiences can have permanent effects on personality development is briefly discussed. It is thought to be due to the fact that the initial learning of immature organisms in conditions of stress has special characteristics.

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THE NATURE OF AUTOHYPNOSIS IN THE LIGHT OF CLINICAL EXPERIENCE.

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INTRODUCTION.

IN December 1950, Salter's valuable book *What is Hypnosis?* (1) was published in England, and some months earlier Strauss (2) had pointed out the wide implications for medicine of Salter's observations, were they confirmed, and indicated the more resistant nature of psychogenic pain, compared with organic pain, to amelioration by hypnotic suggestion. The present article reviews three very different cases in which, at some stage in treatment, an autohypnotic approach to pain was used, and a further case in which autohypnosis, as a means of relief of pain, had been discovered accidentally by the patient. An attempt is made to relate the results and information obtained from these cases to Salter's work and views on hypnosis.

MATERIAL.

The cases presented differ from Salter's material as to age, motive for presentation, and state of well-being. Salter's subjects were young, healthy adults from 22-30 years selected for sound personality and ability to make relationships easily and well; they entered the experimental situation for purposes of monetary gain and/or interest. The patients here presented ranged in age from 33-75 years and were suffering from disabling or highly inconvenient symptoms, for which they sought relief. Two of the patients formed relationships readily, but only one (Case 3) was emotionally well adjusted, the other (Case 1) being neurotically barred from anything more than transient, erotically toned contacts. Case 4 showed a decline from an earlier, more satisfactory pattern of adjustment. In three of the four cases cited both psychogenic and organic factors were clinically relevant; the relationships of these factors to the pain were different in each case. Salter does not deal with this type of problem, for, as Strauss says in the foreword to the book (p. 8), "Salter is more concerned with providing an explanation of hypnosis and hypnotic phenomena in strictly scientific terms than in the application of hypnotism to medical practice. He can therefore afford to detach himself from clinical psychiatry." This detachment may well be of significance, for, in the well integrated, normal subject, it is more difficult to discern the various factors involved in a complex reaction, and it is just in this sense that a study of psychopathological material supplements the study of the normal.

SALTER'S VIEWS.

(Page numbers quoted in the following text refer to Salter, *What is Hypnosis?*)

At no point in his book does Salter formally set out his position with regard to hypnosis, but the several points he makes may be presented as follows:

(1) Hypnosis is conditioning (i.e., the elicitation or production of conditioned reflexes by the verbal or other stimuli of the hypnotist).

(2) The hypnotist does not occupy any affectively significant role in the patient's psyche (p. 49).

(3) The source of the stimuli which bring about the conditioning is irrelevant, i.e., the patient may as effectively condition himself (autohypnosis) as be conditioned by the hypnotist (heterohypnosis).

(4) Some 20 per cent. of people are responsive to the techniques of hypnosis and/or autohypnosis.

(5) "Prestige" either (explicitly) with regard to the hypnotist (p. 50) or (implicitly) with regard to any other aspect of the experimental situation is in-operative in hypnosis.

(6) By making use of evidence (usually verbal) supplied by the patient (regarding his reaction to his own state during the preliminary phases) the hypnotist is enabled more rapidly and effectively to induce hypnosis by what Salter terms "the feed-back method."

(7) Salter claims that the hitherto generally held dictum that an hypnotized subject cannot be induced to act against his moral standards is no longer valid.

TECHNIQUE.

Of Salter's three techniques of autohypnosis the one used in the cases to be described was that of post-hypnotic suggestion with regard to autohypnosis (technique 1, p. 68), although in Case 3 this was modified in that the patient was, early in the course of treatment, introduced into "control" of the situation.

In general terms the patient, after receiving a preliminary explanation of the purpose and technique of the treatment, was hypnotized. When hypnosis was satisfactorily established mobilization of the body schema was undertaken, including—(a) impairment and abolition of motor power, (b) induction of vaso-dilatation and vaso-constriction, (c) induction of anaesthesia and analgesia.

Training was carried out on symptom-free parts of the body, and finally the changes were induced in the affected part. Autohypnotic ability to induce the changes in function upon himself was conferred on the patient by post-hypnotic suggestion once the mobilization of the body schema was achieved, but before the symptomatogenic zone was treated. Thus when the affected part was in fact submitted to suggestion, and the patient was introduced to autohypnotic control of the symptom, he had already acquired skill with regard to parts of the body having less emotional significance.

Case 1.

A married woman, aet. 33, with one child, had suffered for nine months from pain in the teeth and jaws. For this condition (regarded by a senior dental surgeon as osteitis) she was undergoing a series of dental operations, including extractions, resection of the gums, and channelling of the jaw bone. The distribution of the pain involved the lower and part of the middle divisions of the left trigeminal. The corresponding areas on the right side were less affected. Operative procedures had been undertaken, from time to time, during the previous nine months, and the patient's resistance to the unremitting facial pain was failing. Such was the position in March, 1949, when she was first seen by a psychiatrist, who made a diagnosis of "anxiety state and insomnia arising out of organic pain in a somewhat immature subject." At this point a short narcosis with barbiturates was decided upon, but the psychiatrist becoming ill, the author was asked to take over this aspect of the case. A cursory review of the history gave no reason for doubting the diagnosis, and the patient responded satisfactorily to barbiturate sedation with the addition of moderately heavy doses of vitamins.

Towards the end of May of the same year the patient was seen again, in a very similar state of anxiety and insomnia after having undergone a further series of operative measures, and she again responded to a short narcosis. Before she left London on this occasion, however, her history was once again reviewed and nothing untoward came to light, apart from apparent trivia, which later were to bear a different implication, such as fainting twice in church in adolescence, finding the single-handed running of her house unduly burdensome, and worrying, apparently justifiably about nursing-home expenses.

One month later the pain was present but bearable.

At the end of July it was learned that the patient was in hospital in another city and that, in view of the gravity of the pain, alcohol injection of the third root of the left fifth nerve was to be undertaken two weeks later. Although this produced anaesthesia of the chin and the side of the tongue, and a two-day remission of pain, it was followed by hysterical behaviour disorder with increasing pain. She spent one day as a voluntary patient in a mental hospital, but was quite unco-operative and unmanageable. In this condition she was brought back to London in late August and a further narcosis was decided upon.

This third and deeper narcosis was continued for ten days, as opposed to the four to six days of those earlier. She again responded, but on this occasion less completely, and the complaint of pain of unbearable degree persisted. At this stage she was seen again by the dental surgeon, by two neurologists, one neuro-surgeon, as well as by a general

physician. From all these opinions her London general practitioner could not obtain sufficient agreement to advise for or against further dental surgery, or further interference with the lower division of the left trigeminal. Advice to inject the Gasserian ganglion with alcohol was strenuously opposed on psychiatric grounds, in view of the history of the reaction to the injection of the third root, although some action was pressed for in order to alleviate the organic factor in the pain, without irretrievable anaesthesia.

In this confusion of opinion further psychiatric advice was sought, and Dr. E. B. Strauss advised treatment of the pain by autohypnotic training (thereby suggesting the first experiment in the clinical application of Salter's views). At this point it was considered by all who had seen this patient that (1) there was significant organic pain; (2) the patient reacted to this pain hysterically and her general adjustment and control had become impaired; (3) there was no evidence (obtainable on direct clinical interview or from the relatives) that the patient suffered from neurosis.

The clinical picture and the psychiatric evaluation of the case, however, altered radically from this point on. Once trance was established, which was very easy, the patient exhibited symptoms of acute emotional distress, and inquiry released a torrent of very erotic material concerning her present phantasies and her guilt-feelings in relation to them. This material in succeeding sessions rapidly gave way to historical material and transference reactions, the latter being erotic in the extreme. During the first five or six sessions the time was divided between catharsis and training in the autohypnotic induction of sleep and motor paralysis. This latter aspect was then shelved for the time being (and its applicability tested from time to time), as it was now quite clear that the value of the autohypnotic training was, for the time being, much less than the value of the hypno-analytic psychotherapy, and the patient was not progressing beyond the stage of motor paralysis and some poor vascular control. During the course of psychotherapy the patient complained less histrionically of the severity of her pain, and as treatment proceeded her consumption of analgesics and sedatives decreased. It became clear during treatment that she had previously withheld information of which she was quite clearly aware, and which would have enabled a chain of probable psychogenic cause and effect to be related to her symptoms of jaw pain. The essential psychopathology involved unresolved guilt-feeling concerning sexuality, and an identification of sexual gratification with the illicit (to which she was repeatedly strongly tempted, but which she feared too much to allow herself full gratification). A half-hearted extra-marital attachment had developed some years earlier and had been suspended by circumstances, with consequent loss of interest and energy, depression, moodiness, and insomnia lasting for several months and followed by erratic bursts of gaiety and energy. Her symptoms of pain in the jaw developed first when (having accepted the assignation) a root abscess "made her feel too ill" to keep a rendezvous suggested by the third party after an interval of silence. From this time on, although the tooth was extracted and the abscess drained, her pain persisted, at first in bouts, and later continuously, and spread through her jaw, accompanied by evidence of local physical change. Her personal past history was in keeping with her current emotional problem, and involved erotic attachments to unattainable men, with change of affection into repulsion when the relationship threatened to involve the physical aspects of eroticism.

Throughout treatment a very strong positive transference was present, becoming erotically rather less highly coloured in phantasy as time went on.

Once psychotherapy (which was attended by all the usual phenomena of an hysterical reacting strongly, e.g., temperatures, fake sweats, weakness, headaches, emotional crises, etc.) was concluded and the patient adjusted more or less satisfactorily to her then present conditions of life and her commitments, autohypnotic training proceeded smoothly. Induction of anaesthesia in arms and legs preceded the induction of anaesthesia in the face. The patient learned to put herself in trance for five minutes each morning and to give herself post-hypnotic suggestion regarding analgesia of the face for the rest of the day, after she had observed the state of the pain. (She remained under dental observation.)

At this stage therefore the patient was able to control her awareness of the residual organic pain in her jaw, and was reasonably well adjusted to her conditions of life and her emotional make-up on the basis of a persisting positive transference. An attempt by the author to interpret the significance of this last factor and to dispose of it was met by the patient with a reaction of "hurt pride," and she decided at her next interview that she would discontinue her (by now monthly) attendances. She has remained well for two years. The present state of the dental condition is quiescent. Analgesia is induced autohypnotically as occasion demands.

This case illustrates—

- (1) Canalization of psychogenic stress along paths of organic symptoms.
- (2) Blocking of autohypnotic technique by psychic stress.
- (3) Successful autohypnotic treatment of the organic symptoms once the emotional stress was resolved.
- (4) Persistent positive transference, an attempt at the resolution of which induced the patient to discontinue treatment.

Case 2.

A spinster, aet. 40 (a teacher of biology and civics), suffered from a depressively coloured anxiety state with insomnia of long duration. The condition had worsened repeatedly at times of stress such as sitting for examinations, etc., and particularly at times of stress involving her parental relationships. In addition to her psychiatric disability she suffered from chronic osteomyelitis of the right leg, with wasting and trophic changes associated with a good deal of pain.

The exacerbation of the anxiety state for which she sought help had been present for several weeks, and was precipitated by increased demands on her by her aged parents owing to her mother's illness. Psychotherapy with another therapist lasting several months had been beneficial three and a half years before.

Treatment was undertaken by means of narco-abreaction with thiopentone (and ether as occasion demanded).

Much hostility to her father associated with a good deal of guilty feeling was released. Ambivalence towards the mother and the elder sister, who had left home, was also ventilated. The usual parental identifications with authority figures, particularly her professor (she was a part-time student for a further degree in Social Science), were explored and confronted. Her conflict in relation to an inclination to leave home and her neurotic sense of duty was exposed and she was able to resolve this by a rearrangement of her affairs. Her libidinal need was clarified and its present and future probable frustration was accepted, as also was her tendency to generate anxiety in stressful situations, which now, however, was almost controlled. Finally in some three months of treatment she became more fully and stably adjusted to her undoubtedly difficult life situation. At no point in treatment did it appear that she used her physical disabilities hysterically, although she tended on occasion to use them as vehicles of rationalization when avoiding situations liable to put her at a disadvantage. Throughout treatment her attitude to the therapist was predominantly cordial and co-operative in the conscious state, and only in states of marked emotional release under narcosis did elements of resentment or hostility appear. These were limited to situations in which overt father-identification occurred. Their recollection and interpretation by the patient proceeded readily enough.

Treatment of the neurosis having been satisfactorily completed, the patient, hearing of autohypnosis, inquired of its possible value in relation to her physical pain and the apprehension regarding further physical illness which she experienced when the pain in her leg grew worse (as it did from time to time), and interfered with her sleep. (She had undergone many operations on account of her bone disease, and had hence been away from work a good deal in the past years.) It was decided to try the experiment. To begin with all went well. Hypnosis was fairly readily induced, and with it motor paralysis of the unaffected limbs could be achieved. Vascular changes in the hands were elicited and also in the healthy leg. A particular point was made of associating all these changes with a mental state of calmness and poise. When it came to auto-hypnotic application of conditioning to the painful limb the patient experienced a sense of anxiety and conflict, finally saying, "I can't quite let the pain go—it is a warning signal, and if I missed it I might be the worse off." Compromise was reached (eighth session) by replacing the pain and its associated anxiety by "discomfort and concern." Fortunately at this time she was faced by a good deal of unexpected professional stress due to unheralded reorganization of her school and university life, in which she was in each case adversely affected, partly owing to her own mismanagement of affairs.

In reply to her plea for sympathy (the first she had overtly made in a neurotically dependent way) her contribution was firmly pointed out to her and related to her psychopathology, which she had recognized. The result was a dramatic irruption of hitherto unexpressed hostility dating back to the previous phase of psychotherapy, when it had appeared that the father identification had been sporadic and near-hypnotic. Equally striking was the almost total loss of the power of autohypnosis and the learned conditionings, although the benefit obtained from the narco-analytic phase remained. The negative reaction spent itself in a series of bitter letters and two near-tearful interviews. One month later she came one morning in a more quiescent frame of mind, with her limbs in a variegated state of sensory change. Her left leg was hot, her right leg near-numb, her right arm cold and her left arm powerless, "just for fun as I came along." The insomnia did not fully respond, and the experiment was terminated with the re-establishment and consolidation of the autohypnotic ability, without further intervention by the therapist.

This case illustrates—

- (1) Concurrent physical and psychiatric disabilities, with no apparent hysterical exploitation of physical symptoms.
- (2) Apparently successful treatment (narco-analytical abreaction) of the psychiatric state.
- (3) Subsequent successful induction of autohypnotic control of physical symptoms and their emotional effects.

(4) Disruption of autohypnotic ability associated with the release of hitherto unexpressed negative transference.

(5) Spontaneous re-establishment of autohypnotic ability associated with resolution of hostility, and without further hypnotic assistance from the therapist.

Case 3.

A married man, aet. 75, suffered from pain in the right phantom leg after amputation above the knee eight years earlier on account of popliteal aneurysm. From that time any emotional stimulus was liable to evoke pain or disagreeable sensations in the stump or in the phantom limb. Lancing pain shooting down to the phantom heel also occurred from time to time. Particularly evocative of severe pain were simple associative phenomena, such as seeing children jump and land, jarringly, on their heels. On the whole pain was well controlled with 50 mg. pethidine by mouth daily. Occasionally (once in six or eight weeks) an injection of scopolamine gr. $\frac{1}{4}$ was necessary.

The personal past history included coronary thrombosis on two occasions, twelve and eight years ago, and two short-lived depressive attacks in one year, twenty years ago, which resolved spontaneously.

The family history was striking in that both parents and the three siblings died of heart disease. In business, domestic and social life he was happy and successful.

Autohypnotic training, with a view to relief of pain, by Salter's technique I was undertaken, but was deliberately modified in order to minimize the role of the hypnotist. Initially the patient was very sceptical of the possibility of hypnosis, but when at the end of the first session he found he was in light trance he was impressed and rather perturbed. He made remarks such as "incredible that it should happen to me," "a touch of the old black magic," and laughed about the situation in a rather nervous way. These reactions occurred in spite of a preliminary discussion in which "hypnosis as conditioning" was explained to him and the stage atmosphere was directly discredited. The induction of hypnosis was carried out in a brightly day-lit room, and a silver pencil was used as the fixation point held in a position where no eye muscle strain was involved. Commands were entirely avoided, as were exhortations. At the next session Salter's technique was modified by inviting and encouraging the patient to induce his light trance upon himself (instead of increasing his sense of submission and "magic," by subjecting him to further hypnotic experience for which in the face of his perturbed reaction, or even by virtue of it, he was "ripe"). This was done by repeated induction of sleep alternately by myself and by the patient. At the fourth attempt he was successful. At the fifth attempt the pencil was mechanically supported in the requisite position. By the seventh attempt the induction was linked to his breathing rhythm, seven breaths being his trance signal. This had been achieved by the end of the third treatment session. By this time the patient was completely reassured and had lost his perturbation. He continued to be amused at this strange and unexpected faculty which he had discovered in himself. He went away for one month and continued to practise light trance induction daily. When he returned for further treatment he expressed his pleasure with the technique, which had increased the enjoyment he derived from his afternoon rest.

The next phase in treatment was to use his self-induced trance, or the trance I induced, to engraft suggestions of loss of motor power, sensation, and vascular change. All these were applied to the upper limbs and all were partially successful and no more. Three further sessions were thus spent, at the end of each of which he was regretful that he could not "do better" but did not show surprise or disappointment. When at the end of the sixth session I informed him that I felt progress was too slight to warrant continuation, as very deep anaesthesia and analgesia would be needed to be of value in his phantom limb pains, he agreed entirely, and averred that the whole experiment, though failing in its initial object, had been a most interesting experience.

This case illustrates—

(1) Neurogenic pain with spontaneous conditioning to analogous phenomena—no overt history of neurosis.

(2) Anxious response to the experience of being hypnotized, i.e., "subjugated."

(3) Reassurance when taught to induce his own light trance.

(4) Subsequent limited success in the development of vascular and anaesthetic changes—"I can't quite let it go."

(5) The deliberate yielding of the therapeutic dominance resulted in re-establishment of the patient's basic negative attitude to the possibility of hypnosis, the reassertion of his own sense of non-suggestibility, and failure to develop further conditioning.

Case 4.

This case differs from the preceding ones in that the patient, aet. 73, had spontaneously developed the ability to put herself into a light trance-like state, and autohypnotic techniques were not used in the attempt at treatment of this case. (She was seen in 1947, i.e., before the publication of Salter's monograph.)

The presenting symptoms were of pain involving the *right* fore-quarter, from the base of the neck to the lower ribs and spreading down the upper arm as far as the elbow. Particularly acute pain was felt in the breast. The symptoms dated from an attack of shingles three and a half months earlier, which was associated with a pneumonic condition of the *left* base. On examination there were residual scar marks over parts of the distribution of C.6, and D.3, 4, 5, posteriorly on the right side. This patient had sought treatment from a great number of practitioners (but had refused x-ray treatment), obtaining relief of a few days' duration on some occasions. Subsequently she also benefited, temporarily, from what was described to her as "Radar" treatment!

The patient had been married for forty-nine years, her husband being 76 years old. She had a married son aged 48, who was overseas, but contemplated returning to England on account of her ill-health. She missed him very greatly. Her daughter, aged 45, was also married, but lived nearby. In the past the patient had been, domestically and socially, a dominant person, but in the last twelve years had been hard of hearing, and more recently had become somewhat reduced in circumstances. Her life, consequently, now lacked a goodly proportion of the colour which she had always enjoyed.

The patient quite overtly exploited her pain socially and domestically, and used it in the following tyrannous manner. She had discovered that by clasping her hands on her abdomen when recumbent she could enter an hypnoid state in which she no longer felt the pain, and in which she felt relaxed, as if she were floating, and experienced a sense of ease and well-being. The pain was reduced after such exercises, which occupied 30-40 minutes, for periods up to two hours, and so the procedure was repeated several times daily. In order that this technique be effective, she needed an assistant, either her daughter or her husband (who was severely disabled by arthritis). The role of the assistant was to kneel at the side of her couch and place one hand on her forehead and the other on her clasped hands. This position had to be maintained without movement by the assistant or the effectiveness of the seance was destroyed. The cost in physical discomfort to the husband was great, and the cost in domestic dislocation to the daughter was considerable.

Reluctantly I agreed to the general practitioner's request to attempt to treat this hysterically reinforced and prolonged pain by hypnosis. On the first occasion, at the patient's request, I occupied the role of the assistant, and witnessed the development of increased regularity of breathing and catalepsy of the eyes. She seemed to be in a light trance state. It was impossible to test for anaesthesia because of the immobility of "the assistant" required by the patient. On the second occasion I hypnotized her, in spite of her remarks that it was not possible, etc., and in spite of her complaint of increasing pain during the induction period. Her auto-induction took some four minutes. Under hetero-suggestion some ten minutes were needed, and more use was made of a dominating, challenging approach as the minutes went by, with phrases such as "Your eyes are getting heavy," "You cannot keep them open, however hard you struggle—struggle as hard as you can your eyes are closing down," etc. Hypnosis was well induced, and motor paralysis and anaesthesia were rapidly produced thereafter.

Strong post-hypnotic suggestion was given for relief of pain. On recovery the patient expressed surprise, but no pleasure that her pain had lessened. Two days later she cancelled her appointment for the next day. Two days later still a message was received to say that her improvement lasted only one day and that she was now in worse pain than ever and would have no more of the treatment.

This case illustrates—

- (1) Spontaneous development of autohypnosis.
- (2) Exploitation of symptoms and technique for purposes of domestic dominance.
- (3) Lack of insight into the situation.
- (4) Attempt to cast the therapist in the role of "son."
- (5) Retreat from therapy together with a reassertion of symptoms when her dominance was effectively challenged.

DISCUSSION OF CASES.

These four cases may be held to call in question Salter's (1) views regarding the role of the hypnotist in hypnosis, and also, associated with this arises the question of the importance of affect in the hypnotic situation. The role of affect has been, indeed, quite disregarded by him, although there is evidence in his case-records of

its importance. The curiosity and interest displayed by so many of the hired subjects led them to refuse payment; in other words they were affectively involved in the situation. On pp. 38-39 (M.4) is described the introverted youth who could not respond sufficiently and who was discarded; here is an absence of affective involvement. Similarly the importance of affect is made clear on p. 39 (F.13), when the patient became distressed on account of "obedience" to the hypnotist and the hypnotic training was thereby impaired. On p. 58 (M.52) the affective value of simile involving being in a cave in inducing hypnosis is made quite clear. On p. 72, discussing the second technique of autohypnosis, the importance of using a "well informed and convinced hypnotic subject" is pointed out (in other words a subject for whom the question of hypnosis, its existence and efficacy are affectively highly charged).

Cases 1, 2 and 4 show quite clearly the importance of the affective disposition of the patient towards the hypnotist, and in Case 2 the irruption of hostility was associated with a loss of ability to make use of conditionings which the patient was able to supply to herself quite successfully when the hostility was absent. This case shows that Salter's view, that the source of the conditioning is irrelevant, may be open to much qualification. This is discussed more fully later on. Case 1 preserved the positive transference at the cost of the therapeutic relationship, and Case 4 rejected the therapeutic relationship in favour of keeping her symptoms. In the latter instance had a similar problem been presented by a younger patient, analytical therapy would have been undertaken before any attempt at challenging the symptoms was made. In Cases 1 and 4 the relationship between pain and psychic stress is similar, and the cases show how conditioning may be obstructed by pent-up feeling. This latter point is illustrated, but in a quite different time relationship to psychotherapy, by Case 2, in which therapy had been apparently completely, but in fact only largely, concluded when affective blocking of autohypnotic ability occurred.

Cases 1, 2 and 4, may be regarded as instances of partial inability of the personality to maintain full integration on account of emotional stress, while Case 3 is an example of a well-integrated individual. In this instance, however, the very experience of hypnosis evoked anxiety, and the fact that the affective reaction was not exploited is to be related to the failure of the technique. Without an affective response, whether overtly expressed (as by Salter's patients, in terms of surprise, etc. (p. 59)) or not, hypnosis cannot proceed. While the quality (positive or negative) of the feeling is almost irrelevant for hetero-hypnosis, negative affective responses to the hypnotist may interfere with auto-hypnotic ability. Doubtless the ease with which autohypnotic powers are thus impaired is related to the length of time, among other factors, during which the subject has incorporated those powers as part of his own equipment of adjustment.

Cases 3 and 4 both demonstrated the reaction of "submission" to the hypnotist, Case 3 by her reaction of superiority beforehand, ("Young man, you cannot hypnotize me"), and Case 4 by the contrast between scepticism beforehand and anxious incredulity afterwards. Cases 1 and 2 do not show, overtly, this reaction; it would seem that the clarity of expression of this feature of the hypnotic situation would depend, possibly among other factors, upon (1) the personality of the patient and of the hypnotist, (2) on the emotional state of the patient. When there is little secondary gain from symptoms (contrast Cases 2 and 3 with Case 4) the patient is more eager to accept help, and "submission" becomes "co-operation," unless and until negative transference or hostility to the hypnotist is evoked, when "co-operation" becomes "resistance" or "opposition" and the patient must then "submit" to hypnosis. In Salter's cases, just because the subjects were healthy extraverted individuals, selected from many candidates (and were given to understand that only a small proportion of applicants would prove suitable), the likelihood of the overt expression of resistance to hypnosis and hence the elicitation of a submission reaction would be small. Evidence that it did, nevertheless occur, is given in the case records (M.55, F.47, (p. 47) M.40, (p. 41) F.48, (p. 38) F.13). Further evidence is given in his second and third techniques of autohypnosis. (In the second method the patient awaits the hypnotist's sanction before the learned stimuli become effective, and in the third method various concepts are "hammered home" upon the subject; only after he has been "well drilled" at a given stage is a further step taken, etc.)

GENERAL DISCUSSION.

Salter (1) treats his material from a behaviourist point of view, and repeatedly asserts "Hypnosis is nothing but conditioning." At no point does he clearly define what he means by conditioning, but it is frequently illustrated by reference to experiments on conditioned reflexes in animals and work involving the autonomic nervous system in man (pupillary and vascular changes). He then proceeds as if these experiments were a sufficient illumination of the complex behavioural, integrated motor and sensory responses of his hypnotic subjects. The significant topic of the relationship between conditioned reflexes and hypnosis will be considered further below. On p. 49 he specifically denies the "prestige" or authority role of the hypnotist as having value, and throughout, in keeping with a behaviourist approach, scouts the question of relationships, attitudes, and conflicts except for mentioning the last on one occasion (p. 39).

Throughout the text, apart from the reporting of the cases and the description of the techniques, it is quite clear that Salter implies that the relationship between the hypnotist and the subject is irrelevant, although he gives a great deal of evidence that, without admitting or taking stock of it, such a relationship is indeed active and important (p. 39 (F.12); p. 41 (F.48); p. 47 (M.40); p. 55 (F.47); p. 59 (M.52)). In addition to these references which concern the case-reports, it is abundantly clear, in Salter's descriptions of his techniques, that the hypnotist bequeaths his power to his subject, who is unable, apparently, to take this power until it is so bequeathed. For instance, in technique 1 the power of autohypnosis is given by post-hypnotic suggestion, and even the allusion to Svengali and Trilby is not insignificant (even on behaviourist principles, where these two symbols connote dominance and submission). In technique 2 the subject is already "drilled" or "convinced" about deep hypnosis, and even though he has the experience of entering such states, and is given a typescript of the stimuli which will become effective, these do not so become until the hypnotist on a given occasion sanctions their use, and may, if indicated, reinforce their power by a degree of hetero-hypnosis. In technique 3, a preliminary procedure of waking suggestion with a modification of persuasion is used to "hammer home upon him" (the subject) the implications of certain experiments in suggestion, and the subject is then convinced that the source of suggestion is immaterial. At this point, surprisingly enough, Salter reverts to hetero-hypnosis, and is careful to warn the hypnotist not to risk failure in the induction of, e.g., anaesthesia, lest the subject's "confidence" (i.e., his sense of security in, and dependence upon the hypnotist's powers and technique) be damaged. After the hetero-hypnotic induction of trance the subject is taught to induce it for himself. Salter admits in describing his technique that he will on occasion use overtly self-contradictory remarks, e.g., when a subject is unable to rouse from trance Salter will say, "Come on, wake up, you're the boss," etc. In other words the subject is (and perhaps Salter too) consistently distracted from the fact that a relationship of submissiveness to the hypnotist and his technique exists. The existence of such a relationship is hardly surprising in that it is a typical response, in various situations, and involving varying extents of the personality, throughout life.

To consider further the question of "prestige": Salter considers that he has avoided all use of the influence of this factor by his studied informality of personal approach, but he stresses repeatedly the importance of "technique," and it is quite clear that he has succeeded only in transferring the "prestige" from himself to the science or skill of which he is an exponent. This attitude is one in keeping with our time. "Prestige" is obviously closely connected with the role of the hypnotist as an authority-figure, and this Salter also discredits. However, evidence exists in his case-reports to show how these factors continue to be operative. On p. 39 (F.13) the patient "could have been hypnotized against her will!" On p. 41 (F.48) the deliberate exploitation of the theme of powerlessness and submission is described. Similar evidence occurs elsewhere (p. 47 (M.40); p. 55 (F.47)), and on p. 59 Salter comments on the surprise and incredulity of the subjects when hypnotic phenomena first occur. In the same way that Salter overlooks the problems of prestige and dominance-submission in their more covert forms, so does he (in seeking to reduce the phenomena of hypnosis and the hypnotic situation to conditioned reflexes and techniques of conditioning) overlook the

significance of affect in the hypnotic situation and the involvement of affect in the actual operation of engrafting of attitudes (or conditionings). The role of affect has been illustrated in the case-reports and discussion of the four cases cited.

CONDITIONED REFLEXES AND HYPNOSIS.

In conditioned reflexes affecting the autonomic nervous system such as the pupillary reflex in Hudgin's (3) experiment and the vasomotor reflexes in Menzies' (4) experiment affect as such is hardly involved; for the experiments are concerned with replacing a usual stimulus by an unusual, but emotionally neutral trigger to an emotionally neutral response. Not only do the subjects "do nothing" when the stimulus "contract" is verbally applied, but they experience no activity for instance (in Menzies' experiment) when they murmur "crosses" and the temperature of the control hand drops. To generalize from this sensori-motor arc to behaviour sequences, attitudes, awareness, ethics and body image phenomena, as Salter does, is to overlook the significance of the increasing integration and complexity of the nervous system and the psyche which is recognized by all forms of systematized clinical psychology and which is so clearly formulated by Kretschmer (5). From the literature one may cite examples of the increasing importance of affect and of relationships as this scale of complexity and integration is mounted until, at one point, the phenomena of hypnosis in its traditional sense are encountered. This point is at a non-rational psychic level. Thus, in the experiments already cited, only extended, atypical sensorimotor arcs are involved, and affect and relationships are absent as significant factors. In Pavlov's classical experiments a more complex level of integration, that of the instinctual response is involved, and affect is at once of importance. The sated dog does not respond to the conditioned stimulus. When the conditioned stimulus is not followed by gratification, abolition of the response soon occurs. Stimuli requiring unduly refined differentiation (the ellipse and circle experiment) with alternative hedonic consequences (gratification or pain) rapidly produce disorder of response with affective tension, etc., most readily described as neurotic. In these experiments affect and instinct are both involved and the organism is far from neutral. Similar phenomena occur in humans in similar stimulus-response situations.

More complex still is what may be described (following Kretschmer (5)) as the hyponic-hypobulic type of reaction. In humans this is occasionally seen in high grade mental defectives and in conditions of fugue, etc. It may be induced in certain individuals by drugs or by adequate hypnotic interference with psychic integration. In states of clouded consciousness, relatively simple and purposeful sequences of actions may occur. Such mental states are unstable and usually transient, and may be regarded as transitional states between instinct-response behaviour and the "partial reaction" of Kretschmer.

To be considered also is the catathymic response, essentially a primitive non-logical emotionally over-invested form of awareness. This is brilliantly exploited, by Wolberg (6) in his hypnoanalytical technique when he induces changes of affective significance in his subject in response to colour, form, and tone, that is, in response to emotionally determined, non-rational sensory experiences. Here affect is involved to a high degree, and object relationship also. These are the levels of deep hypnosis at which positive and negative hallucinations can be induced. To elicit such reactions a major abrogation of the integrated psyche must occur, and a correspondingly powerful relationship with the hypnotist is needed to obviate undesirable perpetuation of the condition. Salter rightly warns against teaching the autohypnotic evocation of this level of the psyche, though he is silent concerning his reasons. Clinicians have long recognized the caution necessary when dealing with such phenomena.

The catathymic response and the partial reaction are the analogues of the cognitive and conative aspects of the fully conscious person. The partial reaction is a state in which instinct claims and complex-determined responses manifest in behaviour which is unaffected by cognitive and ethical considerations. Such behaviour occurs spontaneously when affective stress has eliminated all but crude patterns of relationship, which then remain as channels of expression of massive feeling. In this kind of response affect is significant; goal directed behaviour is marked, and may be, for a period, quite complex. The goal encompasses the

crude reduction of tension by means of gratification of the inner needs, and relationships both with objects and persons are emotionally overcharged, even when the behaviour appears inhumanly callous. At such times the quality of the experience of the individual may be one of clouding of mind or of unreal clarity, depending upon the degree of abrogation of the more highly integrated aspects of the psyche (or the degree of the disintegration). Disintegration to this extent is far from uncommon, may be induced by alcohol, drugs, or emotional stress, and in any given individual depends upon the existence of undeployed affect of extreme intensity, or upon the existence of a disposition to act in the given way which is normally restrained by the dominant character pattern. Thus the cases of anti-social or anti-moral conduct cited by Salter take their place with other well-known phenomena. It is a matter of regret that Salter, repeatedly claiming the possibility of the hypnotic induction of immoral behaviour, does not attempt to account for the prepotency of the engrafted conditionings nor considers the implications of the pre-existing mores, even regarded only as pre-existing conditionings opposed to the immoral stimuli being applied. The formula relating hypnosis and unethical conduct might be re-stated thus: the ease with which a given subject may be induced to transgress his own moral code varies inversely with the tenacity with which he holds that code, and directly with the ease of disintegration of the psychic hierarchy.

Interposed between the partial reaction and fully integrated behaviour (personality reaction in Kretschmer's (5) terminology) lies a field of experience and response which may be termed the phanto-affective reaction. This level of integration is little influenced by logic, rational considerations, or empirical formulae derived from the testing of reality in experience. Ethical considerations also apply with less than their accustomed clarity, and are often, more or less completely, replaced by their ontogenetic precursors, namely precepts deriving from earlier experience. This particular zone of psychic experience and reaction is accessible to all; to some almost at will, and to others in states of emotion. Prejudice, desire, fear, affection and irrational, complex-determined sentiments and attitudes dominate experience and perception; behaviour is complex, sustained and goal directed. This is the source of most emotionally determined behaviour commonly met with in ordinary living, and most routine psychotherapy has its most effective impact on the subject here. Hypnosis, whether analytical or suggestive, mainly operates at this level, for hypnosis to the point of hallucinosis is quite unnecessary for the vast majority of cases. In the phanto-affective reaction affect is, in one guise or another, dominant, and human relationships are formed with much greater facility than when the fully developed, critical, rational, cognitive processes interpose their barriers between experience and the emotionally toned response which usually carries with it the sense of subjective reality, and immediate acceptability or unacceptability of the experience.

Hypnosis, in the traditional sense, then, may be regarded as a form of experience in which the critico-rational levels of the psyche of the subject are abrogated, and in which the subject enters into a relationship with the hypnotist whereby the hypnotist exploits the affective determinants of the subject and uses these as the mordants of the attitudes and reactions, etc., it is proposed to introduce. This means that affect is the mordant for the conditioning it is proposed to engraft.

Hypnosis can occur only over a limited range of the psyche, namely, in Kretschmer's (5) terminology, from the catathymic-partial reaction up to, but excluding, the personality-reaction, including, however, the phanto-affective reaction level. Between a conditioned reflex and hypnosis lies the whole non-rational structure and organization of the psyche. The technique of inducing hypnosis is the technique of evoking non-rational factors and allaying with their attendant anxieties the rational-critical factors in the psyche. Classically the latter is brought about by reducing extraneous stimuli and by presenting awareness with a monotonous stimulus, pleasantly toned, relating to the body image, and to attitudes connected with it. In this context Salter's "feed-back" technique is seen to be apt. By thus depriving awareness of substance for critical thought those features of consciousness associated with critical thought are no longer evoked, and so awareness becomes more even, and also more limited to the stimulus and response at a non-rational level.

Salter claims (p. 25) that trance is unimportant, yet in his description of tech-

niques he refers to it as a key criterion in autohypnosis (pp. 66-67). Indeed, in technique 3 of autohypnosis he claims to have explained trance away, whereas he has illuminated its quality. All the similarities quoted by Salter (pp. 25-26) between the trance and the waking state are physiological phenomena, yet trance differs from normal waking consciousness in the same subject, and from sleep—

- (a) In muscle tone, and spontaneity of movement.
- (b) In the withdrawal of attention from the background of the situation.
- (c) In the more or less marked inhibition of sensory awareness with regard to one or more sense organs.
- (d) With regard to the reduced inhibition of affective reaction, particularly when emotional stress exists.
- (e) With regard to the greater facility for recall (particularly of affectively charged material).
- (f) In the more or less marked abrogation of a rational, critical attitude to the situation involving the subject and the hypnotist, i.e., an alteration in the approach to reality.

Essentially one or more of these characteristics may occur in what is called normal consciousness, but as Salter's technique 3 of autohypnosis indicates, when all are present together trance ensues, and ordinary consciousness with its pattern of focal awareness and background of roving attention is abrogated. From what has been said earlier it will be clear that what is identical in trance and wakefulness is the non-rational integrated psyche. It would be remiss to conclude the discussion of Salter's views on hypnosis without making clear the writer's appreciation of his contribution to the field of hypnosis. Salter has drawn attention to some of the physiological roots of hypnosis, and has finally, one hopes, blown away the last cobwebs of magic which lingered about the field even in scientific and medical minds. This vigorous monograph is stimulating and provocative, and serves admirably as a statement on hypnosis from a behaviourist point of view. The present article, deriving from clinical experience, necessarily embraces a wider approach to the complexities of human behaviour than is compatible with the abstraction of behaviourism (so clearly formularized by Polanyi (7)) adequate as these may be for laboratory experiments of certain types. Having thus exposed some of the physiological roots of hypnosis, Salter has cleared the ground for a fresh clinical approach to its therapeutic and technical aspects, an essay in which has here been attempted.

SUMMARY AND CONCLUSIONS.

- (1) In hypnotic phenomena there are several factors involved.
- (2) The suggestions (conditionings) presented to the subject may be in the form selected by the hypnotist (or conditioner), or may be modified in the light of the patient's evidence regarding effective portions of the suggestive (conditioning) sequence (the feed-back method).
- (3) These conditionings become effective in proportion to the degree of acceptance and conviction and belief of the subject in the actual situation.
- (4) Affect is required for this transmutation from an intellectually received idea into a factor in behaviour operating more or less autonomously.
- (5) Disturbances in the affective factor may influence the available skill or acquisitions in hypnotic practice of the subject.
- (6) The relationship between the patient and the therapist, either *per se* or as an exponent of a semi-magical procedure, may in certain circumstances appear as one of more or less marked submission, the more marked the more the integration (at a personal and social level) of the subject is disturbed, and the more secondary gain is derived from symptoms.
- (7) In autohypnotic phenomena and practice the subject is led to arrogate to himself (often via a good deal of reassurance) the authority previously resident in the hypnotist or his skill (introjection).
- (8) Hypnosis is conditioning, but conditioning involving factors of affective response and covert relationships not made clear by Salter, who worked mainly with material which was unfavourable to the revelation of these factors.
- (9) The difference between a conditioned reflex and an hypnotically engrafted conditioned response is the whole non-rational integration of the psyche.

(10) Hypnosis can occur over a specific range of psychic integration, namely from the level (in Kretschmerian terminology) of catathymic-partial reactions up to, but excluding the level of full personality reactions. Conditioned reflexes occur at a level of the psyche below this, namely the levels of sensorimotor response (whether central or autonomic) and instinctual response.

(11) Clinical evidence challenges Salter's view that the role of the hypnotist is irrelevant in hypnosis.

(12) Salter's views on the question of hypnosis and unethical conduct are inadequate and a fuller formula is proposed.

(13) Four case-histories are presented illustrating—

(a) The problems of the inter-relationships of organic and psychogenic factors.

(b) The relationships of patient and therapist.

(c) The influence of affect on autohypnotic skill.

(d) The significance of "prestige" and "authority" in some form or another in the hypnotic situation.

I wish to record here my thanks and indebtedness to Dr. E. B. Strauss who first suggested this study in regard to Case 1, and referred Case 3 for experimental treatment. His interest in the cases and constructive criticism have been of the greatest help.

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MYANESIN IN PSYCHIATRY.*

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In the course of a systematic investigation of the pharmacological properties of α -substituted glycerol ethers it was found that some of these compounds produced muscular relaxation and paralysis. In small doses, administered subcutaneously, muscular relaxation and a sleep-like condition were produced in laboratory animals—in larger doses there was ataxia followed by paralysis. Of the various compounds studied, mephenesin was found to be the most potent and to possess the greatest margin of safety, and it is this product which is used, for oral administration, in Myanesin Elixir.

While the pharmacology of the preparation does not seem to be precisely established, certain welcome features are evident :

It is quickly broken down in the body and there is no cumulative effect.

In suitable doses it produces muscular relaxation without causing respiratory arrest or affecting blood-pressure.

There is evidence to support the view that its action is due to its depressant effect on the reflex excitability of the spinal cord, and Freudenberg (1950) has noted that, in certain psychiatric conditions at any rate, it produces a beneficial depressant action on the cerebral cortex.

In neurology, treatment by Myanesin has been given extensive trial chiefly in cases of Parkinson's syndrome, in spastic conditions, and in tetanus ; in general the results have been considered satisfactory. Even in those cases—such as severe tetanus—in which this could not be said, there were certainly no adverse toxic reactions. In epilepsy the drug seems quite definitely to raise the convulsive threshold, and this effect may also be noted in the administration of E.C.T.

Since 1949 there have been several reports on its use in psychiatry, chiefly in the treatment of cases of anxiety tension (Ström-Olsen, 1951) and, to a lesser extent, in cases of alcoholism (Schlan and Unna, 1949 ; Freudenberg, 1950), and though no extravagant claims were made, the general impression was favourable.

During the past year we have used Myanesin in the treatment of 68 patients, mainly those presenting predominantly anxiety symptoms. In every case an effort was made to assess the previous personality, to establish the duration of the disorder before treatment, and the presence or absence of precipitating factors : the duration and dosage of Myanesin treatment was also noted, together with the presence of adjuvants.

The previous personality was assessed according to the criteria of Paster and Holzman (1949) as "excellent," "good," or "poor." EXCELLENT in those patients who revealed no history of neurotic or psychotic determinants, had a good occupational record, and were well adjusted socially ; GOOD in those who revealed a history of common neurotic determinants, who over reacted to situations of moderate emotional stress but who had not shown incapacitating neurotic behaviour or malignant mental trends and had adjusted fairly well in their respective communities ; POOR in those who had a past history replete with neurotic determinants and psychopathic traits, who were unable adequately to meet everyday stress and strain, with poor occupational records and sometimes with a history of previous treatment for nervousness, or even for psychotic episodes needing hospital treatment.

* Read at the Autumn Meeting of the South-Eastern Division of the Royal Medico-Psychological Association, held at Long Grove Hospital on 14 October, 1952.

The results were described in four categories :

- (1) Complete remission.
- (2) Social recovery.
- (3) Improved.
- (4) Worse, or unchanged.

In our series the results in (1) and (2) were regarded as successes, those in (3) and (4) as failures. All cases in which the part played by Myanesin was considered to be in serious doubt were placed in Group 4.

I. In the first group, the successes, there were 28 cases, and these were made up as follows :

Anxiety state following traumatic experience	4
Anxiety state with physical repercussions	16
Chronic anxiety state in inadequate personality	1
Anxiety State with tension, and few or no physical repercussions	7
Total	28

Previous personality was excellent in 1, good in 23, poor in 4; that is to say, roughly 85 per cent. were good or better.

Duration of disease.—Most cases were under 12 months, but there were 6 with histories between 1½ to 3½ years.

Precipitating factors.—in 17 cases these were present—such as minor accidents, friction at home or at work, housing difficulties, etc.

Length of treatment.—In all cases the average was about 12 weeks—the longest 8 months, the shortest 1 week. 6 cases required treatment for 4 months or more, and the average duration of treatment for the remaining 22 cases was 8 weeks. This shorter period corresponded with our general clinical impression, that the Myanesin cases responded more quickly than other similar cases treated by alternative methods.

II. In the second group, the failures, there were 40 cases. Although nearly all these cases presented symptoms of anxiety and tension, there was a greater variety of conditions, made up as follows :

Chronic anxiety state in inadequate personality	8
Reactive depression	7
Passive inadequate psychopath	6
Hysterical personality with pseudo-tension	5
Mild obsessional states	4
Hypochondriasis in depressive setting	3
Involutional depression (mild)	3
Recurrent endogenous depression	3
Schizophrenia with anxiety and tension	1
Total	40

Previous personality was good in 11, poor in 29; that is, only about 28 per cent. were good.

Duration of disease.—16 cases with under 12 months' history, the remainder from 1 to 10 years or more.

Precipitating factors.—in 21 cases these were present.

Length of treatment.—Average about 6 to 7 weeks—the longest 7½ months, the shortest 3 weeks.

Dosage.—In both groups the dose aimed at was 1 grm. of Myanesin 3 times a day, but patients varied greatly in their reaction to the drug, and it was often advisable to start with ½ grm. or less twice daily. Dilution with water at the time of taking the dose was also advisable.

It was noted that the last dose of Myanesin, taken at bedtime, sometimes had a sedative effect.

Adjuvants.—These included psychotherapy in practically every case, social support in most cases, and rarely, the use of sodium amytal or amphetamine sulphate as indicated.

ILLUSTRATIVE CASES.

(1) C. C—, male, aged 41. A married man with a good previous personality, he had served as a regular soldier and at the time of his breakdown was employed in the G.P.O. Earlier in the year he had lost his mother, to whom he was very attached. Fourteen days before being seen he had a busy day at work and when he went home he had a severe headache and his eyes felt "pulled out." He went to bed but next day he was tremulous, sweating, complaining of pain over the heart and shoulder blade, frightened and apprehensive. He could not work. He was seen on 22 May, 1952, and treated by psychotherapy and Myanesin, 1 grm. *t.d.s.* On 1 July, 1952, he was back at work, his symptoms had disappeared and he was discharged.

(2) D. M—, male, aged 27. A young married man with a good previous personality, he had suffered a severe shock as the result of the suicide of a friend and, over a period of 8 months, he had become anxious, tense, apprehensive, and completely impotent. He was treated with Myanesin 1 grm. *t.d.s.*, by psychotherapy, and a short course of benzedrine, and at the end of 7 months his symptoms had disappeared, he was fully potent, and had made a good clinical recovery.

(3) J. F—, male, aged 21. A young, unmarried man, he had a poor previous personality, an unsatisfactory record both at home and during his period of National Service. For some 6 months his condition had been deteriorating—the chief complaints being of anxiety and tension, accompanied by excessive perspiration, constriction of chest, choking in the throat. His outlook was paranoid, but ineffectual, and he showed poor judgment. Myanesin 1 grm. *t.d.s.* was tried for 3 months together with psychotherapy, but there was no improvement at all and his condition was regarded as one of schizophrenia. Insulin therapy was commenced.

(4) E. A. P—, male, aged 40. A married man with a good previous personality and work record, he had in the previous two months developed feelings of acute anxiety and tension largely centred about disease phobias and probably associated with domestic stress. Psychometry revealed a basically obsessional personality. He was given Myanesin 1 grm. *t.d.s.* for 1 month without any benefit, and in view of this CO₂ inhalation was substituted.

Certain other aspects of Myanesin therapy need consideration. There is no doubt that all patients experience some definite subjective sensations after taking their medicine. In some there is a feeling of relaxed well-being, but in many the effects are far from pleasurable, the chief complaint being of giddiness, of a feeling of unsteadiness and weakness. Others complain of nausea, though vomiting does not seem to occur.

Some patients say that it makes them feel tipsy, and one man said it was like a "bottle of Scotch" and that the effect lasted for two hours. In view of these latter remarks inquiry was made as to how much alcohol there was in the elixir. In 1 tablespoonful (containing 1 grm. of Mephenesin) there are 88 minims of absolute alcohol, so that the average total daily dose would contain about a tablespoonful of absolute alcohol, and it is not thought possible that this amount could have any significant effect.

In most psychiatric conditions, and perhaps especially in anxiety states, the value of, and the need for, psychotherapy in some form is very great, but it does take time before its effect is felt by the patient, and it seemed to us that Myanesin, by providing the patient with some positive, subjective change, and often with quick relief, did pave the way for success in psychotherapy.

From our experience in this series it seems reasonable to draw the conclusion that Myanesin is a useful adjunct in the treatment of anxiety states and tension states, but that it is useless in the treatment of anxiety and tension occurring as secondary manifestations in other neurotic or psychotic conditions.

It is also to be noted that the good results are obtained mainly in those cases with a good inherent prognosis, but that chronicity is no bar to success provided the previous personality is good; and that though the successes reported with Myanesin might have occurred without it or with alternative methods, our impression, based on considerable experience, is that the Myanesin cases responded more quickly than those treated by other methods and required less in the way of psychotherapy and other adjuvants.

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THE USE OF SHORT-ACTING RELAXANTS IN E.C.T.*

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SINCE the introduction of curare to modify the contractions in E.C.T., the use of relaxants has become standard psychiatric practice. These substances reduce the risk of fractures and enable treatment to be given to patients who would otherwise be denied it owing to risks arising from concomitant physical disease. During recent years great efforts have been made to simplify the technique of muscle relaxation, in particular to evolve a method which is short in duration, free from undesirable side-effects and easy in use. In this short paper we give a description of our experience with three drugs recently introduced, namely, Suxamethonium Bromide or Brevidil "M" which we used in 111 treatments, Suxethonium Bromide or Brevidil "E" (70 treatments), and Suxamethonium Chloride or Scoline (653 treatments). These choline succinic ester derivatives have similar characteristics which can be considered together.

According to experimental evidence (Bovet *et al.*, 1949 and 1951) they produce a specific blocking action at the skeletal neuromuscular junction. Their initial, transient, acetyl-choline-like stimulation (Ginzel *et al.*, 1951) (Von Dardel and Thesleff, 1951) is followed by complete block which wears off quickly and is followed by a correspondingly rapid return to normal. In therapeutic amounts they appear to have little effect upon the autonomic or central nervous systems (Thesleff, 1951; Von Dardel and Thesleff, 1951). Cholinesterases, especially serum pseudo-cholinesterases (Glick, 1941; Bovet-Nitti, 1949) are thought to account for their rapid breakdown to the physiological metabolites succinic acid and choline (Castillo and De Beer, 1950b). Hence possibly their transient action and freedom from toxicity. In contrast, tubo-curarine, gallamine and decamethonium iodide are excreted unchanged.

All these drugs produce muscular fasciculation within a few seconds of intravenous administration. The process starts in the face and spreads gradually to the trunk and limbs. The patient may experience muscular pain, and invariably shows respiratory distress while this is going on; therefore a quick-acting barbiturate given either before or with the relaxant, is essential.

Considering the relaxants individually, Suxamethonium Chloride (sometimes known as succinyl-choline chloride, or Scoline) comes first. To begin with, we used this in the dosage recommended by the makers, based on the body-weight, and varying from 0.4 to 1.0 ml. (16 mgm. to 40 mgm. active cation). The amount of thiopentone we used, also recommended by the makers, varied from 0.15 gm. to 0.4 gm. Both substances were mixed in one syringe, as we were assured that Scoline lost only 10 per cent. of its efficacy in 5 minutes when mixed with thiopentone. We found, however, that four-fifths of the recommended dosage produced adequate protection in women, possibly owing to their having less muscle tissue than men. This smaller dose resulted in more rapid restoration of breathing and therefore became our standard technique for women, the full dose being retained for men. We also found it possible, in some cases, to reduce the recommended dose of thiopentone. We gained the impression that this tended to shorten the period of apnoea.

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Scoline produced less fasciculation and slower respiratory arrest than the other two drugs, so we found the one syringe technique quite adequate. The thiopentone acted sufficiently rapidly to prevent the patient from experiencing discomfort. A two-syringe technique was used experimentally, giving thiopentone first, then the relaxant. This had advantages in trying to reduce the dose of thiopentone to the smallest possible limit, but the extra trouble did not appear justified in routine use. The relaxation following Scoline was almost uniformly good, often the only manifestation of the convulsion being slight peri-orbicular twitching. Oxygen inflation was carried out as a routine after the fit and was nearly always necessary. Apnoea lasted for one or two minutes usually, up to four minutes occasionally, once seven minutes and once ten minutes.

The next drug for consideration is Suxethonium Bromide—Brevidil "E." In the dosage recommended by the makers we found that it produced painful fasciculation and respiratory distress within 5 to 10 seconds. A two-syringe technique using the barbiturate first was therefore imperative. Even so, we found fasciculation more rapid and severe than with Scoline. The relaxant effect was extremely transient, so that we had to give the shock only 20 seconds after the injection. The relaxant effect was markedly inconstant both as between different individuals, and in the same individual at different times. For example, a woman weighing 5 stones had 60 mgm. of active cation with practically no relaxant effect; another of 8 stones obtained full protection with only 40 mgm. On the other hand, resumption of breathing was so rapid that oxygen was hardly necessary except as a gesture. No case of prolonged apnoea occurred.

The third relaxant, Suxamethonium Bromide, or Brevidil "M," we used initially in a dosage of 0.3 mgm. of active cation per kilo of body-weight. In rapidity of onset, shortness of duration and lack of respiratory complications it was similar to Brevidil "E," and therefore also required the two-syringe technique. Our first impression was that Brevidil "M" gave more consistent relaxation than Brevidil "E," but a later batch gave rise to second thoughts. With this batch results were very inconsistent, even though the dose was increased to 0.4 and later to 0.5 mgm. per kilo of body-weight. More important still, with the 0.5 mgm. dose two cases of prolonged apnoea occurred, of 5 and 6 minutes respectively.

In evaluating our results, it is fair to say that we would have been satisfied with Scoline had it not been for our case of apnoea lasting ten minutes (reported in the *British Medical Journal* of 10 May, 1952), together with other cases reported in the medical press. We have not given undue weight to these other reports, as most cases occurred in connection with anaesthesia after rather larger doses than those commonly used with E.C.T. In one instance also neostigmine was administered, and may have assisted in prolonging apnoea. Since our case of respiratory arrest was reported, we have had a further case lasting seven minutes which somewhat resembles that reported by Wolfers in the *British Medical Journal* of 4 October, 1952. It occurred during the fourth treatment in a series of ten, the same dose having been given throughout without any untoward result occurring before or after. We therefore tried the Brevidil preparations in the hope of finding a relaxant with the advantages of Scoline but without this drawback.

Our early results gave us the impression that Brevidil "M" was superior to Brevidil "E" in certainty of relaxation. However, inconsistency did occur in Brevidil "M," and when we increased the dose we encountered apnoea of five minutes and six minutes in two treatments out of twelve with little improvement in reliability of action. Our experience to date with both Brevidil compounds leads us to conclude that certainty of relaxation cannot be guaranteed even with doses substantially greater than those suggested by the makers. In the case of Brevidil "M," increasing the dose incurs the risk of lengthy respiratory paralysis.

A proper perspective on this disadvantage of Scoline can perhaps be obtained by our finding that prolonged apnoea occurred only twice in 653 treatments.

Our general conclusion then, at present, is that Scoline is the most satisfactory short-acting relaxant of these three. It gives consistently adequate relaxation with comparatively little risk of dangerously long respiratory arrest. Furthermore, a one-syringe technique can be employed, with consequent saving of time and trouble. We have not yet jettisoned Brevidil for we feel that, with further modification in administration, it may well prove to be a safe and rapid relaxant.

A further point which requires discussion is the efficacy of protection in cases of hypertension. We found no rise in blood-pressure when decamethonium iodide,

Scoline and Brevdil " M " were injected with pentothal, no shock being administered. In E.C.T. with and without protection the blood-pressure patterns were similar, though further investigation into the relationship of this rise to such factors as age, autonomic lability, etc., is required. Protection in hypertension is perhaps of doubtful value, but violent fluctuations during the convulsions are probably reduced.

We should like to thank Miss Munro, the Matron, Mr. Baker, the Chief Male Nurse, the nursing staff, and our colleagues, who have given us invaluable help and advice in carrying out these investigations.

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THE HIGH INCIDENCE OF HUNTINGTON'S CHOREA IN THE DUCHY OF CORNWALL.

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WHEN one finds a legend associated with a disease it may be accepted as a general rule that little is known about its true cause. This is exemplified by Huntington's chorea, of which it is said that the original case was a man who imitated Christ's agony on the Cross. A great deal of work has been done on this complaint, but much of it has been to do no more than to confirm the findings of Abel Huntington, who recognized its hereditary nature in 1797.

Before George Huntington published his paper in 1872, several other doctors had recognized and described the disease, e.g., Waters in 1842, and Huntington's father and grandfather, who were both doctors, had recorded cases. Part of Huntington's original description is as follows:

"The HEREDITARY chorea as I shall call it, is confined to certain and fortunately a FEW families, and has been transmitted to them, an heirloom from generations away back in the dim past. It is spoken of by those in whose veins the seeds of the disease are known to exist, with a kind of horror, and not at all alluded to except through dire necessity, when it is mentioned as 'THAT DISORDER'.

"It is attended generally by all the symptoms of a common chorea, only in an aggravated degree, hardly ever manifesting itself until ADULT or MIDDLE life, and occupying years in its development, until the helpless sufferer is but a quivering wreck of his former self.

"It is as common and is indeed, I believe, MORE common among MEN than women, while I am not aware that season or complexion has any influence in the matter. There are three marked peculiarities in this disease; (1) its hereditary nature, (2) a tendency to insanity and suicide, (3) its manifesting itself as a grave disease only in adult life"

It is the object of this study, not only to provide fresh material for the information of other workers, but also to examine it against the conclusions which have been drawn from previous investigations.

Our observations are made on 23 cases of Huntington's chorea. Of these, 13 are cases in the Mental Hospital of the Duchy, 4 were relatives who had died in the hospital, all being certified. The remaining 6 are being cared for at home.

INCIDENCE.

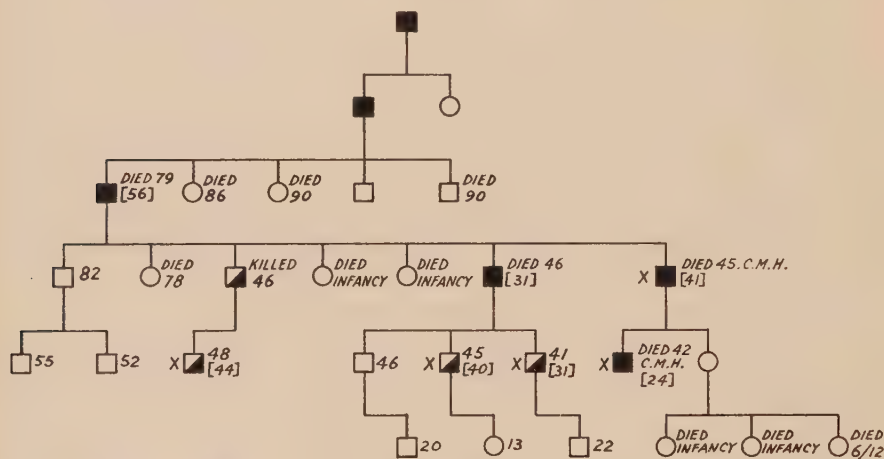
The disease is undoubtedly more common than published statistics indicate, for we have seen undisputable cases of Huntington's chorea diagnosed as "Neurasthenia with Ataxia," "Dementia with creeping paralysis," "Parkinson's Disease," "Disseminated Sclerosis," etc. As Bell (1934) pointed out, and as our cases show, a considerable number of cases never require admission to a mental hospital, being looked after at home.

Bell, with her fellow worker Armstead, in 1933, investigated the incidence of the disease in Lancashire, and found 7 such cases. These occurred in a population of 5,039,097, giving a known minimum of 0.14 cases in 100,000 inhabitants. Bell concludes thus: "I think we can have little idea what is the true incidence of the disease in the population as a whole."

Critchley (1934), in his historical study, gives the number of patients with Huntington's chorea who were alive in January, 1934, in the mental hospitals of England and Wales. When these figures are examined against the 1931 census figures, the known minimum incidence for the counties known to be most affected were for each 100,000 inhabitants, Suffolk 1.25 cases, Devon 0.40 cases, Essex 0.28 cases, Kent 0.25 cases and Yorkshire 0.19 cases.

Minski and Guttman (1938) used as a basis for their valuable and comprehensive study 34 families with Huntington's chorea, one member, or more of which was at that time in the L.C.C. hospitals. They found that there were alive in that year 26 people with this disease, and the estimated population of the administrative county of London was 4,400,000, giving a possible incidence of 0.60 cases per 100,000.

In a survey of mental hospital population, these same authorities reported that in L.C.C. hospitals there were 16 cases in 23,500 patients, giving an incidence of 0.70 per cent. In the county and borough hospitals of England and Wales in 1934 there were 73 certified cases of Huntington's chorea out of a hospital population of 119,787, giving an incidence of 0.1 per cent.



□ MALE. ○ FEMALE. ■ CHOREA AND DEMENTIA. ◐ CHOREA ONLY. [] AGE OF ONSET OF SYMPTOMS.

C.M.H., CORNWALL MENTAL HOSPITAL. X PERSONALLY VERIFIED. CHOREA PRECEDES DEMENTIA.

The incidence is said to be higher in America, but whether this is a fact or whether the diagnosis is made more readily is open to question. Over 90 per cent. of the American cases have been traced to families that emigrated from East Anglia.

The population of the Duchy of Cornwall is largely a stationary one. The natural tendency of a rural community not to move about much is enhanced in the case of Cornwall by the fact that it has only one boundary in contact with the rest of England.

In 1950 there were in its mental hospital 13 cases of Huntington's chorea. Occurring in a hospital population of 1,207 this is an incidence of 1.0 per cent, which is exceptionally high. By investigating the families of the patients 6 other cases of the disease were found in Cornwall being cared for at home, giving a total of 19 cases in a population of 340,941. This is an incidence of 5.57 per 100,000. The incidence is, however, higher than this, for there are several families not included in this series, as they have no member in the mental hospital.

The stationary population of Cornwall is one of the reasons why it is a relatively satisfactory place to investigate, but this same factor raises doubts as to whether the figures obtained are applicable to the rest of the country, in which there would be greater ease of travel and incentive to leave one's home town. Clearly all investigations such as this are subject to a misleading error, because it required only one family with many affected members to live just within, or without, the census boundary to make a very considerable difference to one's figures.

HEREDITY.

It is generally considered that the disease is transmitted by a single dominant gene, and is not sex linked. Dominance implies that no generation will be spared, apparent exceptions to this being accounted for in part by the dominance being incomplete rather than absolute, and in part by the fact that the disease is not manifest until middle age so that tainted individuals may die before the disease can develop.

Minski and Guttman support this view and quote the study of twins. Of the only 5 pairs of twins who have been recorded as suffering from the disease, 3 were monozygotic and both of each pair had the illness; the other two were dizygotic, and only in one pair were both members affected. In the other pair, however, the non-affected member was healthy at the age of 38.

Davenport and Muncey (1916-17) postulated that the symptomatology of this disease was dissimilar in different strains of the same family, that is, they held that differentiation took place and that these bio-types were truly inherited.

AGE OF ONSET.

In the cases we have collected the average age of onset was 42.8 years for 21 patients.

The following table shows the age of distribution :

Between 20 and 30 years of age 4 cases of Huntington's chorea.

"	31	"	40	"	"	5	"	"	"
"	41	"	50	"	"	8	"	"	"
"	51	"	60	"	"	4	"	"	"

This compares closely with Spillane and Phillips (1937), who gave an average age of onset of 41.0 years for 21 patients, and Minski and Guttmann, who gave an average of 42.4 for 43 cases, and quoted Sjogren, Davenport and Hughes (1924-25), who gave 41.5, 37.8 and 37.1 years respectively.

Ante-dating was formerly much stressed and seems to occur in our cases, but there is no evidence for this now, probably accounted for by the more accurate observation of cases and earlier detection of symptoms. Also, as Davenport and Muncey point out, in the early generations only those who developed the disease late in life are likely to be known, and in the later generations only those who get the disease early will be recorded as having it, and the later developers will not be mentioned because of premature publication.

EARLY SYMPTOMS.

Hughes (America) states that neurological symptoms come first in nearly all cases; we also found that in over half our cases chorea came first. Mental disorder may be precipitated by exogenous factors such as an accident, operation, illness or child-birth. The form of onset appears to be inherited as a bio-type, the onset being the same in each member of an afflicted family.

NERVOUS SYMPTOMS.

Generally twitching or tics in face or hands. Later chorea develops—usually athetoid (the mobile spasm described by Gower). Extra pyramidal rigidity may develop.

MENTAL SYMPTOMS.

Most common are paranoid delusions occurring in a clear setting. Nine of our cases showed such symptoms, which progressed later to dementia. Of these 9 cases, 7 showed choreiform movements before the paranoid delusions occurred. These paranoid delusions may be a reaction to the neurological disturbance, occurring in a constitutionally unstable personality. A disturbance of affect also frequently occurs, the commonest being a depressive state. This may result in suicide before the development of dementia or chorea, hence the diagnosis of Huntington's chorea is not made.

Five of our cases showed depression, three before the development of chorea and two subsequently. This depression may be a sign of degeneracy dependent on Huntington's chorea, or a reaction to the threat of future disease developing, which hangs over the patient like the sword of Damocles.

The son (aged 21) of one of our patients is now being treated for an anxiety state; this may be a sign of degeneracy preceding Huntington's chorea; or it may be a reaction to the knowledge of the hereditary nature of his father's disease.

The illness may be first manifest by an acute confusional episode. A frank psychosis with numerous process symptoms is rare. A schizophrenic picture sometimes occurs as an early sign. These symptoms may occur in siblings not affected with Huntington's chorea.

LATER SYMPTOMS.

Eventually a picture of an organic dementia develops with progressive mental deterioration. The disease may be arrested and no mental deterioration occurs. This occurs as a bio-type.

SUMMARY.

The high incidence of Huntington's chorea in the Duchy of Cornwall and in its Mental Hospital is recorded. The main symptoms of the cases are discussed, and one family tree is given.

We saw these patients in St. Lawrence's Hospital, Bodmin, Cornwall, where we were formerly working. We are grateful to Dr. S. M. Coleman, the Medical Superintendent of the Hospital, for his encouragement and advice in the writing of this article. Our thanks are also due to Mr. F. E. Nutt, the Welfare Officer of the Hospital, for his help in compiling the genealogical trees of the families investigated.

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THE EFFECTS OF ETHYL ALCOHOL ON MAZE BEHAVIOUR AND MOTOR CO-ORDINATION OF RATS. 2. THE ASSESSMENT OF DEGREES OF INTOXICATION.

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A PREVIOUS communication (Carpenter and MacLeod, 1952) described the application of a maze, together with a simple test of limb co-ordination, to the study of alcoholic intoxication in rats, as modified by acetaldehyde. As part of a scheme of work here, it was desired to observe the effect of drugs and other substances upon the degree of intoxication produced in rats by ethyl alcohol. Such studies, pursued by the methods previously given, soon led to a formidable mass of recorded material, some features of which were not adequately dealt with by the scoring technique employed. It became necessary to adopt a scoring system which would give an overall indication of the various manifestations of alcoholic intoxication, to serve for the purpose of compact tabulation of results and the drawing of conclusions.

Various scoring systems have been used by maze workers (cf. Warden, Jenkins and Warner, 1935; Kreezer, 1949) based on errors, time and distance, error scoring being preferred by most. Since the effects of alcohol show themselves in different ways, often apparently independently, it was felt that a composite scoring system should be used to measure the degree of intoxication reached. This is a matter of difficulty even with human subjects, and still more so in the case of rats. It is the purpose of the present paper to describe progress made towards achieving the desired end.

METHODS.

The maze employed was a square Carr maze, equipped with the recording device described in the previous paper of this series. A plan of the maze is shown in Fig. 1. The vertical grid was used, as previously described, as a test of the limb co-ordination. Young adult Wistar rats (*ca.* 160 gm.) were employed, after a preliminary period of training lasting 3-4 weeks. It was found that female rats could be kept for a considerable period without showing very marked increase of weight (necessitating troublesome and uncertain dose corrections) if training was commenced at about 3½ months when the rats weighed about 140 gm. Alcohol was given as 30 per cent. V/V. solution, by stomach-tube.

SCORING.

The scoring system was based on observation of intoxicated rats, and took account of the following features: Wrong entries, time taken to run the maze, progress towards completion when the maze was not fully run, and the state of limb co-ordination. Retracing along the correct path was not scored as error, nor was the distance travelled embodied in the total score, expressed according to the formula

$$1/5t + 5e + 5g - 5q + 24.$$

This formula represented an attempt to combine in an evenly-weighted fashion the responses to administration of alcohol. t was the time in seconds spent in running the maze. For a highly trained rat unaffected by alcohol t might be as low as 9, and usually about 12-15 seconds. $1/5t$ was taken to the nearest integer, and t was never scored above 100 (to avoid undue weighting of such factors as hesitation and physical incapacity to run well), although the rats were given 2½ minutes each to show their behaviour in the maze. e was the number of wrong entries, g the grid

score (+ to + + + + as described in the first paper, scored 1-4). *q* was introduced as a measure of partial success in completing the maze. The four quadrants of the maze from the starting gate to the food compartment were numbered 1 to 4, the food compartment being given the number 5. "*q*" then represented the most advanced region which was reached by the rat in a particular test. As the direction of impaired performance was positive in the case of the other tests, the negative sign was used for *q*. The constant 24 was added to ensure that the score was always a positive integer (minimum = 1). The scoring system was readily memorized, and the appropriate score could be written down in a second or two after inspection of the record.

RESULTS.

The above scoring method was applied to a group of 23 animals, each of which received ethyl alcohol at four different dose levels. The animals were given the various doses in groups of four in a random fashion. Tests were run at intervals of $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ hour following the administration of alcohol.

TABLE I.—*Responses (Arbitrary Scores) of Twenty-three Rats to Graded Doses of Alcohol (3.0 ml. to 4.5 ml. 30 per cent. alcohol per 160 gm. rat.)*

Each rat made three maze runs at intervals of 15, 30 and 45 minutes respectively after administration of alcohol by stomach-tube.

3.0 ml.			3.5 ml.			4.0 ml.			4.5 ml.		
18	3	1	44	44	44	12	7	1	54	54	54
44	13	3	9	7	7	39	12	7	59	49	49
8	8	7	7	7	1	13	11	18	49	39	24
13	3	13	7	6	1	3	6	1	24	8	3
44	29	9	44	8	3	59	44	12	9	8	7
12	10	7	18	49	54	54	54	54	49	54	54
17	7	7	12	11	11	39	49	49	54	54	54
19	7	7	26	14	15	54	54	54	49	49	49
3	2	6	20	20	21	54	49	49	11	11	10
12	7	6	29	8	7	9	9	15	9	8	7
3	8	4	20	44	12	36	10	11	49	49	49
10	29	8	25	11	49	17	7	7	10	18	29
2	2	2	44	9	10	13	12	24	9	20	11
54	29	8	7	2	6	44	44	44	44	44	24
7	6	1	8	7	7	37	9	7	11	9	22
23	49	39	10	10	7	23	7	8	54	54	54
24	3	2	9	8	2	34	2	2	49	49	44
39	44	39	44	21	8	39	5	2	49	44	44
29	7	6	8	8	7	4	14	8	49	25	10
4	4	1	19	59	34	49	44	49	22	21	9
49	24	49	49	44	49	54	49	44	49	44	44
3	15	2	3	7	8	49	44	44	20	44	49
7	7	17	23	12	34	49	14	20	22	14	49

The scores are shown in Table I, from which it is immediately evident that a considerable amount of individual variation was encountered. This at once raises the question of statistical testing, and a difficulty arises over the linearity of the score. Does a difference of 20, for example, mean the same thing in the range 25-45 as in the range 5-25. There is no guarantee that this is so, and if the same number symbol is going to have different meanings, numerical manipulations based on the usual laws of arithmetic become valueless. Some sort of transformation of the raw scores may be necessary before a test of significance of differences becomes even approximately reliable.

A simple test may be applied to check the suitability of the time relations. If the scoring system were perfect and no variation occurred among the rats, then without exception the scores for each rat would rank parallel with the alcohol dose. If therefore the scores are ranked for corresponding time periods, the sum of the changes of rank, taken without regard to sign throughout the experiment, will give a measure of the departure from regularity. When this is done in the present example, the numbers are 80, 61 and 63 for the first, second and third runs respectively. This shows that irregularity was greatest in the first run when the effects of alcohol were just beginning to show. The middle run, half an hour after alcohol, seems probably the best run for comparison purposes.

Next we may consider the plot of the total scores for the middle run against the dose of alcohol, shown in Fig. 1. Since 23 rats contribute to each total, this is equivalent to plotting the mean score. This plot is surprisingly smooth, and affords *prima facie* evidence for thinking that the scoring system has succeeded in showing a gradation of response over the range of alcohol doses employed. The curve shows

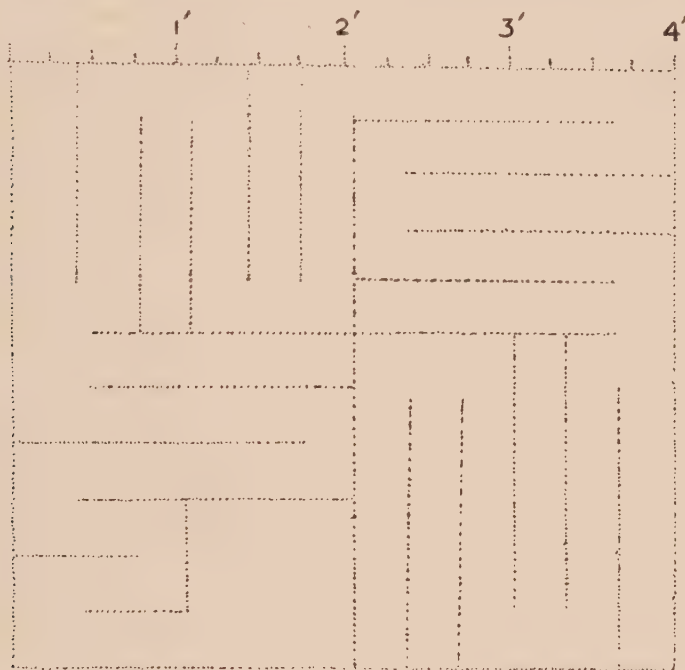


FIG. 1.—Plan of maze.

an increasing gradient with ascending alcohol dose. This may be regarded as a defect of the primary scoring system, reflecting the lack of independence of the various criteria employed to detect deterioration in the rats. As the effects of alcohol make themselves apparent, the score takes note of them in different ways and sums the resultant partial scores, so tending to exaggerate such effects to an increasing degree as they become more pronounced.

It is well known that in animal experiments the transformation (dose to log dose) often has the effect of rectifying the curve of response to drug administration. Clearly in the present instance the log dose transformation would exaggerate the faults of the scoring system further, but it appears that a transformation to log scores might be useful. In Fig. 1 a plot is shown of the log score totals against dose, and may be compared with a regression line drawn from the data on a corresponding scale. The regression line has the formula

$$y = 1.1744 + 0.3122 (\log x - 3.75)$$

$$\text{or } y = 0.0037 + 0.3122 \log x.$$

where y = log score and x = dose of 30 per cent. alcohol in ml. for 160 gm. rat. It

is remarkable that this regression line passes very close to the origin, though the data were obtained at a considerable distance from $x = 0$. Although the plot of the total log scores is not quite so smooth as that of the total scores, it is apparent that the plot is more nearly linear. A test of the significance of the above regression coefficient was made according to Mather (1949), from which it appeared that the coefficient could be regarded as highly significant. This is equivalent to saying that, taking the experiment as a whole, the relationship between the log score and the alcohol dose could be satisfactorily regarded as a linear one. It would therefore be a reasonable procedure to apply tests of significance of differences to the log scores, rather than to the scores themselves.

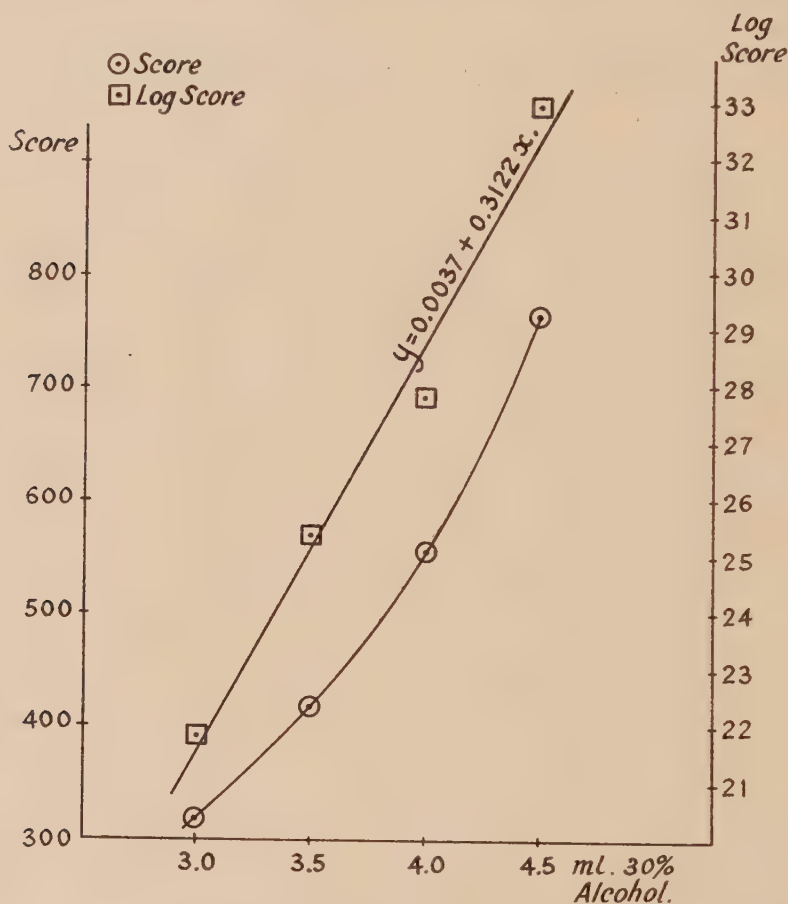


FIG. 2.

DISCUSSION.

The results presented in this paper may possibly at first sight disappoint those who looked for more clear-cut effects on the individual animal. The variable character of the effects of alcohol will, however, be well known to those who have worked on this subject. Indeed, if one may borrow a simile from Dr. Johnson, the assessment of the degree of intoxication of an animal may be likened to a dog's walking on its hind legs; what we find surprising is not that it is done badly, but that it is done at all.

The carrying out of such experiments requires compromises between conflicting requirements. Thus, by giving the alcohol by stomach-tube instead of by injection, the experimenter encounters a set of difficulties arising from variation in the rate

of absorption. On the other hand he obtains the advantages of more prolonged action, which makes time relations somewhat less critical. Again, once any measure of intoxication has been obtained, it might be thought advantageous to plan the experiments according to some fairly elaborate statistical design. In practice, when animals are being put through in quick succession on a fairly tight time schedule, it is found that too great elaboration of the dosage scheme easily leads to confusion and so defeats its purpose.

The reason for the choice of female rats has been mentioned, but there is apt to be some disadvantage in the use of females for experimental groups, owing to the occurrence of the oestrus cycle, representing yet another source of uncontrolled variation. A factor of much greater importance than this is the maintenance of a stable environment. Rats are sensitive to unusual happenings in their neighbourhood, and when so disturbed, may hesitate in the maze or refuse to leave the starting box. An experienced operator may be aware that a particular animal is showing unusual timidity. Nevertheless it is dangerous to discard individual scores as fictitiously high on a purely subjective impression. The principal aim of the procedure given in this paper is to obtain an objective representation of the condition of the animals. The logarithmic transformation of the scores helps, however, to reduce the weight of an occasional high score, produced by external disturbance, and it is of course perfectly legitimate to cancel all proposed experiments on a particular day when it is known or suspected that the rats have been disturbed by some unusual occurrence.

Nevertheless, in spite of the difficulties associated with this type of work, the method employed seems capable of affording a useful working compromise. By this means, one can obtain information on the degree of impairment of the functioning nervous system. This offers an obvious advantage over more drastic procedures, such as the determination of a lethal dose, where one can hardly feel sure that exclusively nervous phenomena are being studied, or that the effects observed bear a close relationship to alcoholic intoxication as generally understood.

No mystical properties are attributed to the scoring system used, or to the logarithms derived from it. Such success as has been achieved depends largely on the fact that the choice of components of the score, as well as the coefficients used with them, was based on a considerable amount of experience of the actual behaviour of intoxicated rats. Another system, based on different criteria, might conceivably yield results as good, or better than those recorded here. It is, however, quite difficult to find suitable quantities which can be measured, and which bear a relationship to the state of intoxication. It will have been noticed that differences of log score have been expressed in effect as differences of alcohol dosage level. This permits comparisons between groups of animals, when alcohol is used as the intoxicant, provided that no other drug or chemical substance, involved in the treatment, shows by itself effects similar to those of alcohol. It is perhaps desirable to stress the point that although in the present paper the actual regression of log score on dose has been found for a group of rats, it would hardly be practicable to do this as a routine procedure, and experience shows that different groups of rats may show quite marked differences of sensitivity to alcohol over a prolonged period. It is, however, assumed that the linear property of the log score holds for particular groups of trained rats under the same conditions and within the limits of alcohol dosage discussed here. Under such circumstances, the log score may be regarded as a quantity possessing the proper metric characteristics to enable valid comparisons to be made. The usual practice has been to give all the rats a priming dose of alcohol (4.0 ml. 30 per cent. alcohol) 2-3 days before the experiment proper was due to commence, a procedure which has been found to make responses rather more regular subsequently. It is hoped to give in a subsequent paper an account of some results obtained by this method.

SUMMARY.

1. A set of criteria is described involving the joint use of the maze and a simple test of limb co-ordination, whereby the degree of intoxication produced by alcohol may be assessed in previously trained rats.

2. The use of a scoring formula is described, which is readily memorized and enables the state of individual animals to be expressed in numerical form.

3. It is found that the logarithms of such numerical scores show a reasonably good linear regression on the dosage level of alcohol. This affords a basis of comparison which may be applied to treatments which alter the quantitative character of the response to alcohol; without themselves producing effects which might be confused with those of alcohol.

The writer desires to express his indebtedness to Dr. W. R. Ashby, of Barnwood House, for a most helpful discussion on the construction of arbitrary scores, and to Prof. Golla, who suggested the use of the maze. Mrs. Carpenter and Miss Clark gave devoted care to the maintenance of the experimental animals. The work reported here formed part of a project on alcoholism sponsored by the British Society for the Study of Addiction, and was supported by their Monthly Bulletin Research Fund.

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THE RELATIVE ROLES OF INDIVIDUAL PSYCHO-THERAPY AND GROUP PSYCHO-THERAPY IN THE INDUSTRIAL NEUROSIS UNIT.

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THE Industrial Neurosis Unit of Belmont Hospital has one hundred beds, two-thirds of which are occupied by males. The vast majority of the patients are chronic psycho-neurotics and psychopathic personalities, who show poor social adjustment. The material treated here is what is usually labelled as "hopeless." Letters from Out-Patient Departments, seeking admission are prefaced, "We know this is a hopeless case . . .," or "If you cannot help him then there is no hope for him . . ." etc. During the four years of its existence the Industrial Unit has evolved and practised a variety of techniques of group psycho-therapy, in addition to the orthodox psychological and physical treatments available in modern psychiatric hospitals. More and more importance is being attached to the value of group methods here, to the extent that some doctors, after taking a brief history, thereafter employ group-therapy exclusively. This paper is an attempt to discuss the relative values and roles of therapy carried out at individual and group levels in the Industrial Unit.

Before commencing the discussion it is necessary to bear in mind (1) the material being treated here, (2) the group methods practised here, and (3) the treatment goal aimed at.

CASE MATERIAL.

As indicated above, the patients have been ill for many years. Many have spent periods in mental hospital. Others have attended numerous psychiatric out-patient departments for lengthy periods. Some are referred here by Probation Officers, while others, with records of prolonged unemployment, are referred to us via the Ministry of Labour.

THE INDUSTRIAL UNIT.

To describe the group methods practised here will entail a brief description of the organization of the Unit, described fully by M. Jones (1947). Every morning, from 9 a.m. until 10 a.m., the patients assemble in a large room with one of the psychiatrists. Monday morning is a democratic assembly where the patients air their dissatisfaction about the hospital routine and the treatment, and offer suggestions to improve their conditions; the psychiatrist in charge of the assembly attempts to meet their demands, explains difficulties of administration, and with the nursing staff and instructors may criticize any shortcomings of the group. On Tuesday morning a film having some bearing on a work or social topic is exhibited, to be followed by a discussion controlled by a Disablement Resettlement Officer (D.R.O.), a Psychiatric Social Worker (P.S.W.), or a psychiatrist. Wednesday morning is taken up with a lecture by a psychiatrist about various aspects of mental health, or about the structure of the body and its relationship to somatic symptoms in neurosis. On Thursday an interview in a Psychiatric Out-Patient Clinic may be reproduced, the patients being invited to discuss the problem and to suggest ways of helping the patient. Friday morning is reserved for "Psychodrama," when a rehearsed play, which is a dramatized version of a patient's life-history, is performed by a cast of patients and staff, before the rest of the patients and staff. The audience then discuss any problems revealed and make helpful suggestions (M. Jones, 1949). After 10 a.m. the patients attend for any interviews with their doctor, the psychologist, the P.S.W. or the D.R.O. Except for the times at interview the patients should spend from 10 a.m. until 12 noon and from 2 p.m. until 4 p.m. in one of the five workshops here. There is a tailoring shop, a hairdressing

shop, a plastering shop, a bricklaying shop and a carpentry shop, each of which is supervised by an Instructor. During the "therapeutic day," groups, varying in size from eight to twenty patients controlled by a doctor, a P.S.W., D.R.O., or a psychologist, are in progress. These groups may listen to music and draw in response to the music, the drawing subsequently being interpreted. They may discuss religion, politics, the behaviour in the ward, work problems or social topics. A patient, in the small group, may raise his or her own personal problem for free discussion. In the evening the patients are largely responsible for their own entertainment. They organize dances, socials, concerts, whist drives, language classes, debates, etc. The average stay of patients here is four months. The doctor has a case load of about twenty-five patients, and very few receive more than one and a half hours of individual therapy during the week.

TREATMENT GOAL.

What is the treatment goal aimed at here? We must recognize that the most difficult problem, in relation to the psycho-neurotic, is within himself. We must also accept the fact that very little can usually be done about this problem, short of psychoanalysis. Here we do not expect to cure patients, in the classical sense of the word, or to make fundamental changes in their personalities. If we can help to remove the symptoms from a patient we are delighted. If we can help a patient to fulfil his role fairly adequately in his family, his work and social situations, *in spite of* his symptoms, then we are truly grateful. We bear in mind always the motto "Guérir quelquefois, soulager souvent, consoler toujours."

Having described the type of patient, the organization of the Unit, and the therapeutic goal, we can now proceed to discuss the relative roles and values of individual and group therapies.

INDIVIDUAL THERAPY.

As mentioned above, the average stay of patients is about four months. Where-as few patients receive therapy at an individual level for more than one and a half hours per week, the rest of their week is spent in group therapy of one form or another. The patient spends five hours per week at the 9 a.m. assemblies. He spends ten to twenty hours per week in the workshops. He may spend two or three hours per week in small groups run by a doctor, psychologist, P.S.W. or D.R.O., and the remainder of his time is spent mixing and living with the rest of the patient and staff group, in the ward and leisure activities.

The theory of the transference, in the individual therapy situation, provides us with an understanding as to why patients may benefit from such treatment. As yet no satisfactory theory has been postulated to explain benefit, if any, derived from therapy conducted exclusively at a group level. In considering the relative values of the group and individual therapies practised here, it is my contention that the most important single factor to be taken into account is the transference situation, created at an individual level. It is the purpose of the remainder of this paper to demonstrate the omnipresence of this situation in the many different aspects of the functioning of the Industrial Unit.

The first relationship, of the baby to the mother, is one based on the alleviation of pain and dissatisfaction. With the development of the ego the child begins to perceive the mother as a distinct entity. This relationship proceeds from one of material satisfaction to one of love. The child wants the mother to be near him all the time. This love relationship is reinforced by the child's absolute dependence on the mother. She provides him with nourishment, warmth, etc.—in fact, she saves him from dying. With this feeling of love is associated an intense fear that the mother may leave him. The child has learned to associate discomfort with the absence of the mother. This love relationship does not proceed satisfactorily from the child's point of view. Previously the mother had immediately satisfied his needs without condition, but as the child grows he perceives that the condition for continued gratification of his needs lies in conforming to parental demands. The mother cannot be with him all the time. He has to be weaned. He has to learn to keep dry and to be clean. The instinctive urges of the child become modified. The child postpones its satisfactions and modifies its aims in order to retain the love of the mother and to avoid being abandoned by her.

The entry of a person into an institution where his life is ordered for him, where a fixed daily routine is laid down, so that he has to exercise little responsibility, is a regressive step in the direction of increased dependency, be that institution the Army, the Navy or a neurosis centre. The doctor is generally accepted by society as a symbol of alleviation of disease. From a very early age we learn that we go to the doctor when we are sick, and we are taught that he will help us. He is a figure of authority and omnipotence. With what gratitude does the anxious family welcome the arrival of the doctor when one of their members is sick? The patient is in hospital for help. He arrives in a position of dependence in relation to the doctor and aides (the psychologist, the nurses, the P.S.W.'s, the D.R.O.'s and the instructors), who are going to alleviate his pain and dissatisfactions. The patient comes with the urgent demand to have his disease removed, and immediately, just as the dependent infant demands satisfaction of its urgent drives. The drives of the child become modified, or are postponed, in order to retain the love of the mother. Bearing in mind the dependent relationship of the patient to the doctor and to the other therapists (P.S.W.'s, psychologists, nurses, etc.), it is possible, by the establishment of a good relationship between the therapist and the patient, to create more socially acceptable attitudes and behaviour patterns in the patient while in hospital. The basis of treatment in a neurosis centre such as ours must be the rapid establishment of a good relationship. It is all very well to talk about analysing and working through a negative transference. That is a task demanding a suitable patient, much time and a trained psycho-therapist. The value of insight to the patient cannot be fully realized unless something constructive is created within him to replace the disillusioning process of analysis. It is argued that it may benefit a patient to "transfer" his internalized hate upon the therapist. But this benefit is purely a negative one. The positive aspect of the improvement, namely changes in attitude and behaviour, will not develop unless the negative transference is replaced by a positive one. Should the patient have no faith in the doctor, should he not accept the tenets of orthodox medicine, then therapy will be a failure. More often in these cases, he does not consult a doctor in the first place, but has recourse to the faith-healer, the herbalist or the osteopath, all of whom have a greater opportunity for success with the "non-believer."

Having suggested an analogy between the child-mother and patient-therapist relationships, how is it borne out in fact? Firstly, patients do improve in hospital either in the sense of loss of symptoms or in change of behaviour. They experience and express a sense of safety and assurance on entry and on return from any leave granted. During their stay in hospital there is very often a clear fluctuation in the symptomatology, corresponding inversely with the amount of attention exhibited by the doctor. Often the imminence of discharge from hospital, i.e., the threat of rejection by the doctor, will precipitate a relapse. The doctor is invested with an astounding degree of omnipotence, even by intelligent patients. Failure to be seen by the physician for one or two weeks, unpunctuality or apparent aggression on the part of the doctor, are all interpreted as being consciously motivated by the doctor in his scheme of the treatment situation. There is also a great deal of identification between the patient and the doctor. His doctor is the best doctor in the Unit. The patient does not want to be seen by, or even censured by, another doctor when his own doctor is not available. As one patient put it—"I have got you fixed inside me. Every time I think of you I get a little bit of strength. If I feel down, I think of you and that bucks me up."

GROUP THERAPY.

As indicated above, the vast majority of the patient's time is spent in one form of group therapy or another. Two questions must be asked. Firstly, what is the function of group therapy here? Secondly, what role, if any, does the therapist-patient relationship, created in individual interviews, play in group therapy?

Dealing with the first question, in mental illness there is a withdrawal of that psychic energy, normally invested on external objects, to the self, resulting in hallucination, fantasy, anxiety, depression rumination, etc. It is mainly through the projection of this energy or libido outwards again that one of the earliest forms of organized group therapy in psychiatric practice, namely occupational therapy, achieves its benefit. The healthy person has achieved sufficient inner freedom to enable him to externalize this libido in productive and meaningful work, in conducting

satisfactory interpersonal relationships, and in an assumption of responsibility for himself.

Let us examine the "working day" of the healthy man more precisely. The man goes out to work. He has hobbies in which he may play a relatively passive role, e.g., the cinema, the theatre or opera. He may be a more active participant, e.g., as a performer in a dramatic society or concert party. His leisure may be occupied by attending lectures or by participating in discussion groups. On examining the group activities of the "therapeutic day" we find striking similarities to those of the "working day." The patients have work therapy in one of the workshops for four hours per day. They are the passive audience to educational and sociological films; to "psychodrama" and at music groups. They may be more active and take part in discussion at these groups or play a part in the "psychodrama" or other projective techniques. They attend lectures at the morning assemblies and they discuss in the small groups. Just as during the "working day" the healthy man conducts satisfactory interpersonal relationships, so in the hospital the patient mixes freely and tries to develop constructive relations with his fellow patients. The staff stress continually that all the activities of the "therapeutic day" (work therapy, morning assemblies, socials, etc.) are essential parts of treatment. Thus, the patient is made personally responsible, in the treatment situation, to the extent that he must participate in the group therapies if he is not to be considered unco-operative and not really desirous of benefiting from treatment. This feeling of personal responsibility is accentuated by the knowledge that above his contribution to his own recovery, he can by active participation in the "therapeutic day" help his fellow patients towards improvement. Just as the healthy man has to assume responsibility for himself, here the patient has to bear a certain amount of responsibility. It would seem, therefore, that the major function of the group therapies here is that aimed at in occupational therapy in mental hospitals, namely an externalization of withdrawn mental energy. But here the externalized energy is canalized into patterns of behaviour more in conformity with those obtaining in real life situations. Whereas the healthy person externalizes his libido readily, the neurotic does not. We find the average neurotic to be apathetic. He wants things to be done for him, rather than do things for himself. He is a child, and just as reasonable parental love and support to the child result in a balanced outflow of libido, leading eventually to an emotionally well adjusted individual, so can a doctor, by creating a good relationship, persuade the patient to participate willingly in group therapy. (Of course one can make other important uses of these group techniques—e.g., the workshops can be used to assess the "employability factor" of patients (M. Jones *et al.*, 1952), the various projective techniques, used at morning assemblies, are valuable from the point of view of the psychiatrist in that they throw much light on the personality and behaviour of the patients participating.)

A patient may be forced to indulge in group therapy by the threat of discharge, but such coercion will negate any benefit that might have been derived. He will attend group therapy, but he will in fact be outside the group. He will be resentful, and will express his attempts to withdraw from the group by arriving late, by slacking at work therapy and by being disruptive. He may derive unconscious satisfaction from such behaviour, but as indicated in the individual situation, this is of negative benefit. We have to instil in the patient an awareness that the group activities (and their counterparts in real life) are a positive and pleasurable part of living. Our aim must be to make the patient actively desire to indulge in the group activities, and this objective may be achieved by the tolerant and patient physician. This is not to say that there should be no discipline. We can get patients to attend the groups by threats and punishment. But from a psychiatric point of view these are useless measures. The result obtained is only temporary. Remove the threats and the fear of punishment and relapse in behaviour results. The patient has already had an abundance of such discipline in real life, with little beneficial effect on his illness. We aim at not merely discipline, but self-discipline, and this is obtained by identification. Just as reasonable, flexible parents will create like patterns in the child, so may such attitudes on the part of the therapist have a like effect on the patient.

Let us examine four group activities, (1) the staff group, (2) work therapy, (3) the morning assemblies and (4) the community in general, with a view to assessing the role of the individual transference situation in these activities.

Nowhere can the effect of this individual relationship on the behaviour of the patient in the group be seen more clearly than in our own staff group, which we have studied closely. When the leader is reasonable and on good personal terms with the members of the staff, then the nurses and doctors, etc., work well, because they enjoy carrying out his demands. They want to please him. Should the group leader be on bad terms with members of the staff they may carry out his behests, but they will satisfy even his most modest demands with resentment and irritability, and consequent deterioration in efficiency.

We find that patients avoid work therapy as much as possible. They arrive late in the shops, they leave early and they employ all manner of subterfuges to absent themselves as much as possible from the workshops. This is partly because in their rationalization, the patients do not consider work therapy as therapy. Most of the patients cling to the belief that treatment only occurs at individual interviews with the doctor, despite the stress we place on all the group activities being therapeutic procedures. We have observed that two therapists are of importance in the workshops. Firstly, the Instructor. We have noticed that when he is a tactful, understanding man with an awareness of the role of the workshop in the treatment situation, then the men display more enthusiasm. The other important therapist is the Physician. When the doctors inadvertently belittle the value of the workshop by allowing the 9 a.m. assemblies to run over their allotted time-span, thus causing the patients to arrive late at the workshops, then we find that the attitudes and conduct of the patients in relation to the workshops is poor. When the doctor reveals that he recognizes the value of work therapy, by prompt cessation of the morning assembly, by frequent visits to the workshop, where he chats to his patients and inspects their work in an interested fashion, then the patients become more enthusiastic. The doctor, by sympathetic encouragement and by explaining to his patient the function of work therapy, can persuade his patient to adopt a new perspective in relation to work therapy.

When one considers the morning assemblies, one sees again the importance of the identification process. If the doctor is not punctual the patients behave likewise. If a doctor, for one reason or another, is not taking charge of one of the morning assemblies, his patients frequently agitate as to why he is not performing. They want *their* doctor to be out there, in front. And yet the process is not one of complete identification, because on the occasion when the patient is asked to imagine that he is a doctor and to advise another patient, the "patient doctor" invariably addresses the patient through the psychiatrist, saying, "I think he ought to do . . . " or "I would tell him . . . ". It is with the greatest difficulty that one can get a patient to adopt a direct approach in such a role with the psychiatrist present. In this group activity, as in work therapy, we see the same reflection of the individual transference situation. When the doctor-patient relationship is proceeding well, the patient's participation in this activity is whole hearted. On the other hand, when the patient is going through a difficult phase, he arrives late for the assemblies, demonstrates his negativism by reading a newspaper, by being disruptive, and by expressing his scepticism of the value of the assemblies in the treatment programme.

From time to time we experience a great deal of unrest in the wards. This is usually initiated by individuals, or small groups of individuals, who have never been able to establish good object relationships at any time, or by patients whose insatiable demands are not being met by members of the therapeutic group. These periods of unrest are reflected in a general increase of anti-social activity on the part of a wider group of patients, who begin to arrive late for meals, are late and noisy at bedtime or are disruptive at group assemblies. There is also a generalized increase in symptomatology. Patients become irritable, complain of headaches and sleeplessness, and express doubt and hopelessness at their condition. The patient senses a threat to the authority of the doctor. He sees anti-social behaviour not being dealt with summarily, as in the real world, and feels that the doctor is not in control of the situation. The doctor's omnipotence becomes questioned. There is loss of faith in the physician, resulting in the increase in individual symptomatology. The patient interviews his doctor and says, "These noisy people should be discharged. They are making me worse. If you do not discharge them I shall discharge myself." The failure of the doctor to protect him represents rejection to him, and by his protestation he is, in fact, testing the love of the doctor for him. We deal with these situations by discussion at individual interviews and in the various groups.

The anti-social behaviour is explained as being a symptom—an attempt to gain affection and attention. The patients are asked to help in the treatment situation by tolerating the disturbing symptoms of the anti-social elements. This display on the part of the doctor, of his understanding of the situation and of the reasons for the permissive attitude of authority, together with a call for identification with him in the treatment situation, usually helps to lessen the tension. The doctor is seen to be in complete control of the situation after all, the faith of the patients in the doctor is restored and individual symptomatology decreases. An example of the identification with the doctor in the treatment situation was clearly seen on a recent occasion. A patient in a moment of blind fury had thrown a cup at another patient and severely gashed the latter's forehead. Numerous patients approached their doctors with a plea for clemency in the handling of the offender, although of course the doctor in charge of the patient was not contemplating any punitive measures.

DISCUSSION.

It may be argued that the concept of treatment described here may result in excessive dependence on the part of the patient. We must face up to the fact that the neurotic is a dependent person and that we here do not fundamentally change him. Generally speaking, the best we can do is to make him as good as he ever was. But as we know from a close examination of his life-history that state of affairs was a dependent one, and we do not hope to improve upon it a great deal with the means of treatment at our disposal. Our psychotherapy is frankly supportive, carried out by reassurance, persuasion, suggestion, hypnosis, counselling, with some attempt to provide insight. *Supportive* is the operative word, and implies that support in one form or another may have to be maintained for the remainder of the patient's life, e.g., by attendance at Out-Patient Departments and Social Therapeutic Clubs, by visits from P.S.W.'s and Mental After-Care Personnel or by the co-operative family group advised by the doctor. We admit that this dependent relationship between the doctor and patient exists. We employ it in the treatment situation. We believe, however, that the danger of excessive dependence is exaggerated. Firstly, reality testing operates continuously, and with the confirmation of the doctor's suggestions the dependency needs lessen. Secondly, the patient is gradually weaned from the doctor just as the child is weaned towards independence. The patient sees less and less of the doctor at individual interviews as his stay here progresses. But he knows that the doctor is always available should he be required. For the infant, the terrifying absence of the mother is associated with discomfort and signifies abandonment by the mother. The constant response of the mother to the distress signal of the infant results in the developing awareness that the immediate absence of the mother does not imply abandonment by, or death of, the mother. The child in fact learns to tolerate the mother's absence. So with the patient. Although at first he urgently desires to see the doctor as often as possible, he begins to recognize that reality needs make it necessary for the doctor to spend less and less time with him because of the latter's obligations to other patients. However, he is secure in the knowledge that in times of emergency, in dire need, the doctor will always be at hand to help him. It is impressed on the patient that discharge from the Unit does not imply abandonment. He is advised to attend out-patients', social therapeutic clubs, and to keep in touch with the P.S.W.'s, the D.R.O. and his doctor. We often hear from our patients after discharge telling us of their progress or of their difficulties. One patient who had left eighteen months ago wrote asking for help. An appointment was made to see her as an out-patient. On arrival she was feeling better, saying, "I began to feel better as soon as I received your letter. I was relieved to know you were still interested in me."

We have made no real study of the effect of the group on the behaviour of the individual, but in the group situations described the behaviour of the individual in the group can be satisfactorily explained in terms of the relationship of the patient to one or other of the therapists (doctor, nurses, D.R.O., etc.).

The leader-group relationship here cannot be accurately compared with that described by Freud in *Group Psychology and the Analysis of the Ego*. There, the leader represents the projected ego ideal of the individuals composing the group, who are united in their love for the ego ideal. That relationship is a more mature one than the leader-group relationship obtaining here. There the individuals

make sacrifice for the common cause unconditionally—they will suffer penance and even make the supreme sacrifice, for example, for their religion or for their country, without any demands on the love object. In hospital the relationship is a conditional one. The patients are not united and without rivalry. They are jealous of one another and seek to obtain exclusive possession of the leader. The patient will only do things for the leader in return for love from the leader, and this love can only be expressed satisfactorily, from the patient's point of view, in individual interviews. All of us have inner drives towards perfection. Projected ego ideals, such as religious and political beliefs, provide us with one form of satisfaction, thus facilitating stabilization. It is one of the aims of the treatment to free such drives in the neurotic in order to help him make an adjustment. The neurotic has no projected ego ideal—his love capacity is too selfish, too immature. The way towards such a projected ego ideal is first through satisfactory identifications.

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DANCE-MIME: A CONTRIBUTION TO TREATMENT IN PSYCHIATRY.

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In the course of treatment by psychotherapy progress is often hampered by the patient coming to rationalize his reaction to problems; while he attains an intellectual insight, he fails to respond at emotional levels sufficiently to enable him to gain relief from tension or to alter existing patterns of behaviour.

It would seem that a mode of therapy which helps a patient to gain insight into deeper levels of the unconscious requires not only the medium of words, but also the symbols appearing in dreams and fantasy life. These may be expressed through the senses, e.g., as line, colour and form in painting, or as rhythm and melody in musical composition, and in body movement, i.e., through visual, auditory, and kinaesthetic channels.

Interpretation of patients' drawing, painting and modelling is used in analysis, and quite frequently these methods of communication are the only ones available at times of crisis in the patient's treatment when words fail to express the idea and emotional content.

Whilst these activities, and to a lesser extent music, are used as a recognized part of therapy, a form of active expression of sensation and feeling which takes place through body movement has not yet been employed to any appreciable extent. The medium of dance as a mode of expression in which the patient can formulate his own symbolism and relate it to reality leaves us with a wide field to explore. Moreover, its application makes use of the fundamental tendency of the individual to discharge emotional tensions in muscular movement.

The present article discusses a method of treatment embodying these principles—as yet in little more than its experimental stages, but which holds possibilities of a regular place in the therapy of psychiatric illness.

HISTORICAL SURVEY.

Dancing has always played an important part in the life of primitive tribes, and was probably the oldest medium of communication between different tribes.

The works of Frazer, Hambly and Havelock Ellis quote innumerable examples of the varied and elaborate tribal rites and religious observances which serve to carry the racial culture and preserve its traditions and moral codes and beliefs, as well as its function in uniting the individuals towards the common goal of successful living and of propagation.

An account of one such rite, the "Dance of Siva," is quoted from Joseph Campbell's *The Hero with a Thousand Faces*, illustrating as it does some of the workings of the primitive mind and the interpretation of the symbolism. When boys of the Australian Murgin tribe reach puberty, "Atonement with the Father" has to take place. The boys are frightened, and sent running to their mothers, as the Great Father Snake is calling for their foreskins; the women play the role of protector. A prodigious horn is blown, representing the call of the Great Father Snake who has emerged from his hole, and when the men come for the boys, the women seize spears and pretend to fight, but also wail and cry because the little ones are going to be taken away and "eaten." On the men's triangular dancing ground, which is the body of the Great Father Snake, the boys are shown, in the

course of many nights, numerous dances symbolical of the various totem ancestors, and are taught the myths that explain the existing order of the world. In this way, within the Great Father Snake as it were, they are introduced to an interesting new object world that compensates them for the loss of the mother, and the male phallus instead of the female breast is made the central point of the imagination. The culminating instruction of the long series of rites is the release of the boy's own hero-penis from the protection of its foreskin, through the frightening and painful attack upon it of the circumciser, the operation taking place to the accompaniment of bull-roarers and ceremonial chanting. Later the boy is attended and congratulated by the older men into whose estate he has just arrived. The ritual is thus the dramatised expression of the oedipal aggression of the older generation, circumcision being a mitigated form of castration.

Freud, in *Totem and Tabu*, describes the use of dance in which primitive sexual libido is transferred to a sublimated form, e.g., to cultivation of the land in fertility rites. The operative factor in all these varied activities would appear to be that the common life situations are acted out. The participants live through the emotional crises appropriate to those situations at the same time as they experience the somatic reactions, and thereby achieve a re-orientation of the total personality towards a more mature outlook.

The following plan (abbreviated from Hambly, *Tribal Dancing and Social Development*) summarizes the main functions in which dancing plays a vital part:

<i>Social.</i>				
Birth.	Initiation of boys and girls into tribal life.	Marriage.	Secret Society Initiation and Periodical cere- monies.	War.
<i>Magico-Religious.</i>				
Worship.	Food.	Sickness.	Funeral.	
Deity.	Hunting.	Exorcism of	Dance to	
Sun.	Fishing.	demons.	lay ghost.	
Moon.	Agriculture.			
Fire.	Rain.			
Snake.				
Ancestors.				
Initiation to Priesthood.				

Dance, then, is an essential factor in all group life of these communities, and has from the standpoint of the individual an integrating function through which he acquires a place with his fellow-men, and develops a sense of social solidarity with a group, a sense of "belonging."

In present-day cultures vestiges of the magico-religious expression survive in the form and design of religious ceremony and in the attitudes adopted in prayer, while traces of the ancient social form are found, for example, in the Floral Dance in Cornwall and in the mass orgies of dancing at carnival time in the West Indies and parts of Africa. Here, sanction of libidinal drives is given during a short time of the season in order to preserve a peaceful and disciplined way of living for the rest of the year.

Apart from the restricted forms and usage of dance to-day, our present western pattern of life omits the expression of feeling in this way, and by leaving behind this most vital means of uniting individuals and groups of people, has impoverished social life. That this lack is somehow felt is perhaps evidenced by the growing popularity of communal dances, e.g., the Conga, the Lambeth Walk, and in the revival of square and country dances.

Now tribal dancing may be regarded as a valuable form of psychotherapy: for example, in the casting out of evil spirits, the participants dance to music and the rhythmic beating of drums, and work themselves into a kind of hypnotic trance, in which a state of empathy occurs, followed by mass abreaction, resulting in a general relief of tension. The individual is thus drawn back into the tribal life, and his immature and weakly organized ego is helped to adapt his instinctual drives to the demands of the environment, the whole process undoubtedly taking place at an unconscious level.

No parallel "therapy" exists in our present Western culture, and the maladjusted individual is deprived of a potentially valuable means of reinforcing his relatedness to the group at emotional levels.

Dance-mime, as a modern method of treatment, may fulfil this purpose in the case of the psychically ill patient, but with this important difference: in primitive tribal life the dancing ritual, in so far as it is successful, holds back the individual at the level of the collective unconscious (to use Jungian terminology), whereas the present aim is to help the patient to experience the unconscious emotional content as a necessary step in the forward process of individuation.

THE ROLE OF MOVEMENT.

In order to appreciate better the function of dance and its possible therapeutic application, it is necessary first to consider the part played by body movements in general, and the use that can be made of them.

It is a commonplace that mood and emotional state find expression in body posture, movements and gestures. The dejected attitude, typically of flexion, with hypotonia and retardation, characteristic of pure depression; the expansive and enlivened movements of elation; the heightened muscular tension and restricted, tremulous and ineffectual movements in states of anxiety and agitation, are obvious elementary examples. Grosser instances are to be seen in psychotic depression and mania; likewise the fixed postures and muscular rigidity of the catatonic patient reflect his mental and emotional blocking and inaccessibility. Indeed the Lange-James theory of emotion went so far as to identify its somatic and kinaesthetic manifestations with the emotion itself. This theory is no longer tenable as such, but it is an empirical fact that the performance of movements and adoption of postures appropriate to a particular mood can induce a change in the direction of that mood. The work of Jacobson (1929) on progressive relaxation likewise confirms that the affective state can be favourably influenced through an essentially somatic process. Considerations similar to these led two of the present authors, working as occupational therapists in a mental hospital, to develop a technique in the therapeutic use of movement.

They first observed, some ten years ago, that even deteriorated (schizophrenic) patients who were mute, retarded and generally inaccessible would respond to rhythm, especially in the form of waltz time, and would sometimes catch and return a ball thrown to them, doing this with increasing speed. This stimulated their first contact with reality. Various experimental classes of exercise, folk dancing and Margaret Morris movement were then included in the weekly programme for those able and willing to participate, but it was soon apparent that all these activities had their limitations. The patients were allowed some free movement expression, but while this was enjoyed by some, other cases were apt to become over-excited and would work themselves into a frenzy unless checked. It was obvious that a form of active emotional outlet was needed that could not be found in these classes. It was also quickly discovered that "drama" requiring elocution and set acting had marked drawbacks. Reading plays or verse was alien, in fact impossible for many patients, and had a limited appeal and physical scope. However, pantomimic action to short nursery-rhymes produced more promising results, and continuous work and observations over a number of years indicated that mime in a broad sense held great therapeutic possibilities. Experimental work on these possibilities led to a much deeper study of the elements of movement as a conscious expressive medium, both in the readjustment of the whole personality and as a diagnostic aid. These aspects of movement can be combined in the form of creative work. The acquisition of a certain amount of expressive technique in movement, albeit very little, is necessary for a person to become able to use this as a medium of emotional expression. Some indication of this aspect of the work is contained in the following paragraphs. The aims are:

(1) In each individual patient to discover the relationship between his particular movements and his affective state, to relieve emotional and physical tension by breaking down the pathological movement pattern and substituting more beneficial ones.

(2) To educate patients in achieving a better physical balance, and through this a feeling of security.

(3) To socialize patients.

(4) To develop powers of concentration.

The more disturbed or inaccessible patients generally need individual treatment, to be described later, before they can join in a group. Those sufficiently able to co-operate are combined in groups of 6-12 patients, and often one or two staff are included. Part of the therapist's task in taking a group is to teach different kinds of movement, as far as possible by leading the patients to discover in themselves the movements which contain the different qualities, for in this process they can also realize their own natural bent and individual difficulties. In addition they can be shown, not as a theoretical assertion, but as a real experience, that different movements (including static tensions and relaxations) have a characteristic "feel," and an effect on inner attitude and mood, which is reciprocal. The work is done largely to music, live accompaniment or percussion being the most flexible and readily adapted to the needs of the moment, though gramophone records are also useful, and may provide a richer background for later dance-mime performance.

RHYTHM.

A good basic rhythm is necessary for co-ordination, and to induce a sense of harmony and continuity. This may be emphasized by the patients also expressing the rhythm vocally. The use of rhythm relieves conscious effort in the performance of movements, and also helps to by-pass the inhibiting action of conscious attention, so that the movement pattern can take effect at subconscious levels.

ATMOSPHERE.

A sense of enjoyment and fun are indispensable, and spontaneity is a vital necessity. Each session calls for great receptiveness on the part of the therapist to appreciate the prevailing mood of the group, and an ability to adapt to the needs of that group.

Patients are encouraged to express their own ideas and feelings, and discipline is minimal, although patients inevitably learn that it is necessary to accept certain modification of their movements, for example, to prevent collisions with others. They also find that the greatest satisfaction is obtained when individual expression is related to the pattern of the group. Thus they can learn by experience the difference between freedom and chaos, and discipline can be understood as a necessary framework through which the general pattern can emerge. In the course of these classes patients begin to recognize that their fleeting or habitual responses in posture and movement are the physical counterpart of their state of mind, and to realize that some constructive change in the one through the other is possible. For instance, a patient may become aware of his attitude of dejection, and in the process of counteracting its physical manifestation experiences a favourable affective change, in itself an experience of great value.

ANALYSIS OF MOVEMENT.

Laban, working on the Continent and in this country for nearly 50 years, reached essentially similar conclusions regarding the dynamic relationships between body movements and postures and mental attitudes, his approach being primarily an artistic one (Laban, 1948). His system of movement analysis and effort training has found application (among other things) to the problem of fatigue and dissatisfaction among industrial workers; significant increase in productivity has resulted from improvement in the psycho-physical well-being of those at work (Laban, 1947).

According to Laban, the elements of movement are: Weight, Space, Time and Flow, and in any movement or effort that a person makes, he either "indulges in" or "fights against" each one of these elements. Thus in the action of wringing out washing the effort is sustained, flexible and strong, and the performer "indulges in" time and space, and "fights against" weight (in overcoming resistance), for example, in total contrast to, say, dabbing with a paint brush, in which the effort is quick, direct and light. Again, the movements of stamping and hitting, in which the performer "fights against" time, space and weight, give an entirely different feeling experience from soft, flowing, very slow movements as in stroking.

The predominant ways in which these elements are used in the movements performed by a given person are indicative of inner attitudes ranging from a temporary mood to deeply rooted personality traits; pathological exaggeration

of the "time-fighting" component and diminution of "flow" are, for example, characteristically seen in anxiety state and agitated depression.

An out-patients group at this hospital recently produced scenes from *Pilgrim's Progress* along the lines discussed previously. Each class began with a physical warm-up usually based on the kind of movements that would be needed later; the idea of the Slough of Despond, for example, might be given, and the necessary efforts practised, the patients suggesting or performing appropriate movements. With the minimum of guidance from the therapist a group movement was evolved, each individual discovering her own value in a communal expression. Patients often recognised their own difficulties, as, for example, Christian bearing his burden, or the man in the Iron Cage of Despair.

Although most people can understand the allegorical situations in this kind of work intellectually, many can experience at first hand the emotions involved through dance rather than through acting. Indeed, it would appear that emotions can be experienced in dance even without any dramatic situation, and this has on occasion provided the first real link with a patient's affective nature, which had hitherto been inaccessible.

Recent work on dance-mime at this hospital has been carried out with two groups of female patients, one consisting of psychotic in-patients, the other of out-patients, mainly psycho-neurotic, but including two remitted schizophrenics.

Psychotic group.—This has been an open group consisting of between five and fourteen patients, mainly chronic schizophrenics. It is with the more deeply disturbed patients and those who are relatively inaccessible that movement-experience in its simplest forms needs to be given and may alone be possible; for example, when even the sense of rhythm is apparently lost, it can often be reawakened by the therapist actually moving the patient about, and thus introducing the element of passive movement. A responsive sensitivity on the part of the therapist to the patient's own movements or attempted movements is most necessary, since an abruptly superimposed change of movement may give rise to anxiety or frank emotional outburst, whereas a gradual development out of his own habitual pattern may open to the patient a realm of activity hitherto utterly impossible to him.

An account of the methods used and the results in this group, which are promising, will, it is hoped, be made the subject of a future communication.

Out-patient group.—This consisted of six to eight members, all of whom had previously received psychotherapy. Four of them attended the weekly meetings regularly throughout one year, and some personal details about each of these are given below. The group was occasionally augmented by one or two occupational therapy students, or suitable in-patients in need of similar group work. After some months' preliminary work as outlined, discussions were held in the group, for the patients to describe, compare and discuss the effects of the treatment upon each. It was possible to observe the extent to which they had gained insight, how this related to the outlet and means of expression they had found, and their improved adjustments both within and outside the group.

CASE I.—I. M.—, aged 30, clerk, single; chronic anxiety state with depressive features and travel phobia. Mother fixated. Inhibited feeling function manifesting itself in difficulty in maintaining relationships with either sex. In the group she preferred to be given a set pattern within which she could work, even that the steps should be part of the pattern. She felt herself to be clumsy and unable to fit in with the others, and was afraid to improvise or venture outside a set pattern "for fear of making a fool of herself." Her movement-behaviour was, in fact, rigid, clumsy and stereotyped, very much a reflection of her whole personality. She was the eldest of three daughters in a respectable black-coated class family, and financial misfortune had caused her to take on added responsibilities as a child. A rigid sense of duty had been inculcated by her parents who denied any outward expression of affection, and dismissed all except material and rational values as being "silly." She had also had little opportunity for play. At first she thought all this "skipping about" to be silly, and the music "just a jangle of notes," but she was willing to try, and liked the exercise. Later, whilst still denying any feeling for music, she said that "some tunes made your feet itch and want to get up and dance to them," and she became more confident in performing movements. Her relationships within the group improved, and she was able to contribute her own ideas and interpretations in the mime. Her usual tendency in "feeling" situations was to react either with inadequacy of affect, or by being overwhelmed by it, but she became gradually steadier, less rigid in behaviour and outlook as well as in her movement, and she has overcome her travel phobia almost entirely.

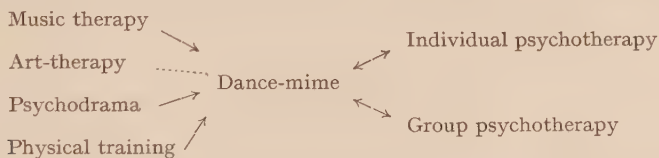
CASE 2.—I. W—, aged 24, single, clerk; an introverted, passive personality, suffering from aural hallucinations in which a musical theme kept repeating itself. She had had a course of insulin comas as an in-patient in view of the (atypical) schizophrenic picture, but the rest of her personality was intact, though of schizoid type, and the symptom appeared more of an obsessional nature. She enjoyed the dance and was able to express herself quite freely in this way, although previously she had had no opportunity for cultivating her taste for music and dance. In the course of treatment by active movement to music the obsessional repetitive tune disappeared, she became less pre-occupied and shut-in, and was able to take up training as a hairdresser.

CASE 3.—O. B—, aged 23, single; recurrent schizophrenic breakdowns since adolescence. Insulin coma treatment had resulted in a remission, and she had since undergone 18 months' regular psycho-therapy, but was still suffering from obsessional trends and aggression fantasies. She was training as a probationer nurse while attending the dance-mime. At first she moved very clumsily and was much inhibited. She had homosexual trends, which became apparent in her masculine way of moving and a preference to take a male lead in mime. She found outlet for her aggressive fantasies, and was able to act out the theme of conflict over aggression and submission. She felt this had freed her, being much relieved to discover that the group had tolerated her aggressive movements and could fit them into the general pattern of a dance theme. She became less guilty and developed a positive enjoyment in the dancing as well as in other activities, replacing her former need to isolate herself in fantasy.

CASE 4.—T. W—, aged 31, single; remitted schizophrenia (insulin-treated). Had undergone psychotherapy for one year before joining the dance-mime group, and was continuing training as a shorthand typist. Her breakdown was precipitated by the conflicting claims of two love-relationships—one with a man of obsessional personality who outwardly gave her support and security but had the effect of subduing her feeling function, the other, a father-figure on whom she had projected fantasies satisfying her own narcissistic needs—these finally ended in delusions and hallucinations. She had a poorly developed ego, and had formerly acquiesced to the demands of all her friends and relations, and failed to become aware of her own instinctual needs. In the dance-mime she moved freely and easily, and was able to express fantasy situations in this way, though usually needing the support of others. She had greater difficulty in following a set pattern; her movements were in fact over-flexible and lacking in directness, so that she was unable to direct herself to any one point in space without deviating this way and that, generally losing her objective altogether. Through dance mime she became more effectively aware of this as a personality problem, and of her need for greater self-assertion and disciplining to a definite purpose. She has succeeded in completing her secretarial training, and plans to take a clerical post whilst continuing with the study and practice of dance in her spare time.

DISCUSSION.

Early in our work it became apparent that dance-mime carried some of the valuable features of each of several different techniques in the treatment of psychiatric disorders. The relationships of these may best be summarized by the diagram:



From the earliest times (in ancient Greece, and in Arabian medicine) music has been used in the treatment of emotionally disturbed patients, and modern studies have confirmed its value (Mitchell & Zanker, 1948; Gilman & Paperte, 1949). In all the usual applications of music for therapeutic purposes, however, the patient is in the position of a passive listener. Emotional tensions are stimulated, but their release is in the most indirect form, and may even not occur at all. In dance-mime music is used, but the patient has a greater opportunity to resolve the emotional tensions engendered or already present by means of a direct physical activity which is meaningful.

With "art-therapy" a patient not uncommonly is able to work through, and obtain relief from, unconscious conflicts in the course of producing a series of graphic or plastic works in which unconscious material is symbolically represented. A similar working-through process appears to take place in successful dance-mime,

using the different art form of body-movement, and again, without the conflicts being verbalized.

Certain similarities with psychodrama are also evident, but the use in dance-mime of movements of the whole body, as previously outlined, enables the affective state to be expressed, and influenced more directly, or at a deeper level. There is also less tendency to the conscious inhibition that occurs so readily when speech has to be used.

Dance-mime as described here is essentially a group technique, and like certain other forms of group therapy it aims at the re-establishment of the normal relationship between the individual and the group, which is disturbed by the individual's illness. The psychodynamics and interpersonal relationships between the members of the dance-mime group can with best advantage be dealt with analytically in the group, along the lines described by Foulkes (1948).

Some indication has already been given of the way in which dance-mime can be used to supplement individual psychotherapy (of an analytical kind), or even to be used successfully where effective psychotherapy is not possible. Mime is the natural expression of emotional situations in symbol; like allegory, it condenses the conflict of a particular situation into a parable, but not in words; and by performing it the individual can experience the feeling content which is not communicable through the medium of words. As in primitive initiation rites and ritual dancing, the abstract emotion can be formulated as a tangible figure, which can then be dealt with by the total resources of the individual. It need hardly be added that the use of dance-mime requires that the therapist should have a proper understanding of what is taking place so that some measure of guidance and control can be used as necessary. Without this the procedure is potentially dangerous, or at best, meaningless.

SUMMARY.

A therapeutic technique is described, based on the use of body movements, through which a patient may become physically rather than intellectually aware of his psychological state, and at the same time have the means to act out the solution at a physical and emotional level.

The rationale of the method, especially in its relationship to primitive and traditional dancing, is discussed, and also its relationship to other methods of treatment in use at the present time.

ACKNOWLEDGMENT.

Our thanks are due to Dr. A. C. Dalzell, Physician Superintendent of Friern Hospital, for his helpful criticism and advice.

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SUBARACHNOID HAEMORRHAGE AND PARANOID PSYCHOSIS.

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SYMPTOMS of mental disorder are common in cases with cerebral tumours and malformations. Progressive dementia, clouding of consciousness and personality changes make their appearance sooner or later. They have been understood as the result of interference with cerebral functions. However, there are patients in whom the relationship between cerebral lesions and mental disorder is obscure. They present conditions not usually associated with demonstrable structural changes, and the coexistence of mental and physical symptoms appears purely accidental, both running their course independently. In those cases a mutual interaction between the two groups of symptoms can often be observed. In the following case such an interaction could be analysed :

Mrs. B. J. M.—was born in 1913, the second of two female children. The home atmosphere was very unhappy. There were constant quarrels between the parents. The father, an alcoholic, deserted the family when the patient was 13 and he has not been heard of since. As a child the patient was excessively afraid of the dark. Her early memories were centred round sibling rivalry, ambivalence towards her mother and fear of her father. She seemed to have been an unwanted child. At school she was shy and self-conscious, but her work was of a good standard. She was always regarded as over-sensitive. At 17 she took up secretarial work and continued in that occupation for eight years. She married in 1938, at the age of 25. She has three children, aged 9, 7 and 5 years at the time of her admission to hospital.

Medical history.—The patient had been physically healthy until February, 1946, when she had a period of severe headaches which incapacitated her for two weeks. Neurological signs were absent. No lumbar puncture was performed. The condition was probably of a similar nature to the two later attacks. In November, 1946, she had a second period of severe headaches, culminating in collapse and semicoma lasting for two weeks. A third attack occurred in August, 1949, when she was comatose for three weeks. During the second and third attacks she was admitted to hospital and remained there for two and four months respectively. On both occasions the c.s.f. contained blood and the diagnosis of a subarachnoid haemorrhage was made. Each time she was free from neurological signs and symptoms, apart from the headaches and the disturbance of consciousness. The recurrent haemorrhages were later proved to be due to a cerebral angioma (see below).

The only other event of medical significance was a Caesarean section in 1948. Pregnancy was terminated in the seventh month because of hypertension and the danger of a recurrence of the subarachnoid haemorrhage.

Psychiatric history.—Neurotic traits in childhood and adolescence have been mentioned above. At the age of 22 the patient had a period of depression lasting for six weeks. Three years later, shortly before her marriage, she had a similar condition. Her attitude to marriage had been ambivalent. She was then suffering from various anxiety symptoms. She was afraid of being alone and had a mild agoraphobia. In 1939 she had a fear of killing herself; the words "commit suicide" often came into her mind and she was unable to suppress them. This symptom persisted until 1946. Between 1940 and 1942 she feared lest her father came back and beat her, although she was aware that that fear was quite unfounded. In 1944, at the age of 31, she became interested in religion, to which she had previously been indifferent. She formed an attachment to the local parson and sought his advice on problems of all kinds. But it was not until after her first attack of physical illness in February, 1946, that her religious preoccupations became obviously abnormal. She expressed delusional ideas, spoke of the parson as her spiritual husband and called herself her husband's mother. She believed that she was being influenced by the parson telepathically, and that she could influence him and others in the same way. In 1947 the patient moved from the provincial town where they had lived since her marriage to London. Her ideas about the parson receded gradually, only to be replaced by similar ideas about the doctor who attended her in London. His surname happened to be identical with hers. The patient was admitted to the Maudsley Hospital on 13 April, 1951.

The role of emotional stress in the precipitation of physical symptoms.—There were definite indications that emotional stress played a part in the precipitation of each of the three periods of acute physical illness. In early February, 1946, the patient's husband was transferred to London, and he had to leave his family behind until he could find a suitable home in town. He was to be with them during the week-ends only. The patient was very apprehensive about being left alone. At that time she had become emotionally involved with the parson and was in a state of conflict over this. The first attack of incapacitating headaches obviously due to a slight subarachnoid haemorrhage, occurred when her husband's departure was imminent, and when she had become aware of her growing attachment to the parson. At the same time her compulsive suicidal ideas were at their worst, and they were associated with the fear of the return of her father. In that state of emotional turmoil, on the day of her husband's impending departure, the first attack occurred. Shortly afterwards she suddenly felt the absolute conviction that the story of Christ was true and that the parson was a part of God. During the summer she insisted on having her children baptized by the parson. The fear of suicide and of her father receded, but the delusions

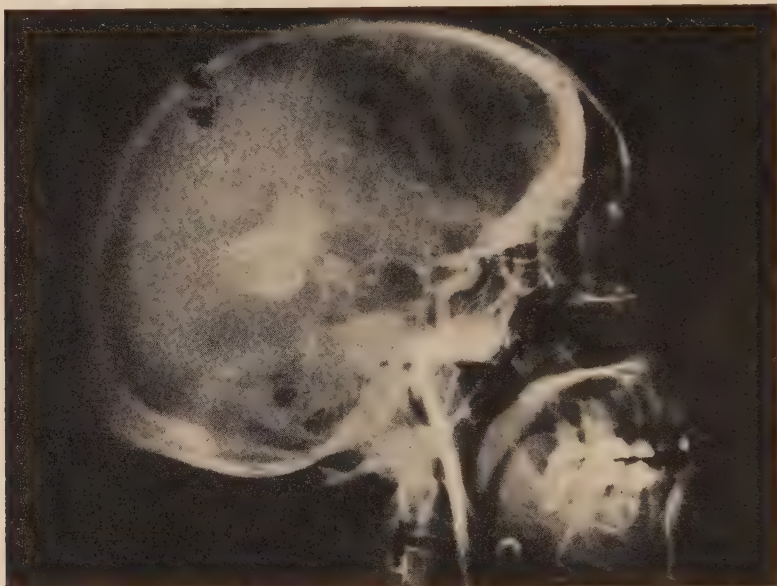


FIG. 1.

about her relationship to the parson and her husband remained unchanged. In November she moved to London to join her husband. She was most distressed about having to leave the neighbourhood of the parson, with whom she "communicated by an elaborate system of thought transference." After one week in London she returned to her previous place of residence for a week-end and there the second attack occurred, again in a state of great emotional stress. This time the diagnosis of a subarachnoid haemorrhage was definitely established. Between the second and third attack (November, 1946, to August, 1949) she remained in London. When in 1948 she first attended Dr. M., he soon became the centre of her delusional ideas. The third attack occurred suddenly when the patient was on her way home from shopping. She saw Dr. M.'s car outside her house and collapsed. Her attachment to him was then at its height and she had fantasies of giving "spiritual birth" to him.

The patient's attitude to her physical symptoms and their effect on her mental state.—The patient denied being ill and considered her recurrent illness as spiritual events. The physical symptoms were closely integrated with the delusional experiences. The first attack was regarded by her as an "attack" by which faith in God entered her head. "After this attack I was able to believe in Christ." In the second attack she said, "God entered into me through my head. I feel what has happened since then has been God working through me . . . from then on my mind started to grow." The third attack was experienced as a similar spiritual event but with a variation. "I felt that God entered into Dr. M.; I had to take suffering for him. He could not take it himself because he was needed by his patients." After that illness she felt more secure and less depressed, an improvement

which was associated with frequent visits to Dr. M. for tablets which were regarded as a sacrament.

Behaviour in hospital.—The patient was admitted in April, 1951. She was anxious and often depressed. She freely expressed the delusions described above and the feeling of being laughed at. She denied her status as a patient, and declared that she had been admitted only to help others through the powers given her by God. She often complained of deep and diffuse headaches. They were "a transference of power—a growth of the spirit." She was suffering like Christ to acquire special powers to help. The pain was regarded as a sacrament—"a part of me is being given to others." On other occasions she believed that her pains were experienced by others. Pain had a twofold meaning to her: it was a means by which she received spiritual power, and also the means of transmitting this power herself. She also expressed a similar idea about the significance of the Caesarean section, which had resulted in the removal of a dead child. She was convinced that the child's spirit was taken out of her womb and transmitted to another human being in need of it.

Psychological tests (Goldstein-Scherer, Rorschach) failed to show signs of organic impairment. The Rorschach test was not typical of schizophrenia.

Neurological examination was negative. No abnormalities of the cardiovascular system could be found on physical examination. E.E.G. recordings did not reveal definite anomalies.

Neuro-surgical investigations were carried out at the Guy's-Maudsley Neuro-surgical Unit. X-ray of the skull was negative. Bilateral common carotid arteriography revealed a large arterio-venous malformation situated in the region of the trigone of the left lateral ventricle and supplied by the left posterior cerebral artery (Fig. 1). The left carotid arteriogram showed filling not only of the posterior communicating and cerebral arteries plus aneurysm, but also of the left middle cerebral branches. The right carotid arteriogram was normal. The location of the angiomatous malformation made surgical treatment impracticable.

The patient was discharged in July, 1951, and was seen in the out-patient clinic at regular intervals. Her psychiatric condition remained unchanged. She was emotionally labile, lacking in interest and energy, but was able to do housework. She was last seen in July, 1952, when her condition was unchanged.

COMMENT.

This is a case of an extensive angiomatous malformation in the left hemisphere which resulted in two, probably three, subarachnoid haemorrhages. The absence of neurological signs suggests that the blood oozed directly into the subarachnoid space or the ventricles without damaging nervous tissue. From the neurological aspect this patient belongs to a well-defined group (C. P. Symonds, 1923, 1924). From the psychiatric point of view she presented several unusual features which are of general interest. Emotional stress appeared to have played an important part in the precipitation of the subarachnoid haemorrhages. The role of that factor in angiomas has so far not been considered in the literature, though a few observations have been reported which are relevant to this problem. In one of Cushing and Bailey's (1928) cases of cerebral angioma the symptoms become more severe when the patient was depressed. Baruk (1931) reported a similar observation and assumed that emotional stress was liable to cause vascular changes resulting in attacks of migraine. The effect of mental stress on all types of headaches has been amply demonstrated (Wolff, 1948), and migrainous attacks have been known to culminate in rupture of aneurysms (Symonds, 1923; Wolf, Goodsell and Wolff, 1945). The sequence of events leading up to the subarachnoid haemorrhages in the case presented here was very similar. A closer psychiatric study of the antecedents of subarachnoid haemorrhages may show that such an effect of emotional stress is far from rare. Rise of blood-pressure might be the chief precipitating agent. Minski (1938) advanced a similar hypothesis concerning the first symptoms of brain tumour, which, in a proportion of his cases, had followed physical and mental stress. More recent studies suggest that rise of blood-pressure might not be the only effect through which emotional stress may cause haemorrhage. Schneider and Zangari (1951) have found that acute anxiety causes shortening of the clotting time and increase in the relative viscosity of the blood. In the case of an angioma this may lead to increased tendency to thrombosis, resulting in a reduction of the abnormal vascular space. Such changes, together with the rise of the blood-pressure, might increase the liability to haemorrhage. If one follows Schneider and Zangari, who regard those changes in the blood chemistry as part of a protective reaction pattern, one might speculate whether they might not also tend to operate against a fatal outcome of such an occurrence.

The emotional stress under which this patient was labouring was all the more powerful as it was fed from delusional beliefs. The relationship of the paranoid psychosis to the vascular malformation in the brain was certainly not one of cause and effect, though the changes within the angioma may have contributed to the development of the mental disorder which otherwise may have remained latent. It is futile to speculate whether such an effect be due directly to some structural change, or to a vague awareness of physical illness which, in a predisposed subject, may have called forth abnormal mental reactions.

The early symptoms of mental disorder seem to have appeared before the first episode of physical illness, but there can be no doubt that the three attacks had a profound influence on the patient's mental state by exacerbating and modifying it. It was only after the first episode that the delusions came into the open. The attacks were experienced as an important event within her world of delusions, and on each occasion the centre of happenings was the head, which was the site of the physical symptoms. Only in that part of the body were the boundaries between the self and the non-self broken; the patient felt that supernatural power poured into it from outside and emanated from it to other people. Thus physical illness attacking the head was not only denied as such, but the symptoms were transformed into experiences of magic omnipotence. It must be remembered that the head holds a special position in the body scheme; injuries to and symptoms on the head tend to have a profound psychological effect, usually causing an excessive awareness of illness and discomfort affecting that part of the body. In this case, on the contrary, there was complete denial of physical illness, the symptoms of which mobilized, and threw into relief, mental mechanisms common in schizophrenics, i.e., the blurring of the boundaries between the self and non-self, associated with overt projection and introjection. There was only one other occasion when similar mechanisms were associated with an event in another part of the patient's body, again one that is of outstanding importance psychologically; the Caesarean section was experienced in the same way as the head symptoms.

It is noteworthy that the attacks of physical illness, which were denied by means of emotionally charged (katathymic) delusions, had been precipitated by emotional stress flowing from the same sources as the contents of the delusions, i.e., the patient's relationship to the other sex, which had been profoundly disturbed from childhood. The patient's unhappy relationship to her father had played an important part in the etiology of the anxiety symptoms, of which the patient had never been free from childhood onwards. The limitation of her delusional experiences to a certain area of her emotional life enabled the patient to live outside hospital and function comparatively satisfactorily as mother and housewife.

The denial of physical illness and the substitution of its symptoms by delusional experiences observed in this case is akin to anosognosia and other "neglect phenomena"; but in those cases symptoms of physical illness, though denied or distorted, are not experienced as part of a profound change of the patient's relationship to the outer world as it happened here. That peculiar quality is more likely to attach itself to physical symptoms in schizophrenics than in other subjects. Hemphill and Stengel (1942) reported similar reactions in paranoid schizophrenics where physical illness or surgical interference had resulted in a break in the body surface. The authors expressed the opinion that the precariousness of the boundaries of the body image in those patients favoured delusional interpretations of physical symptoms in terms of strictly localized introjection and projection. The patient presented here showed that tendency not only in the way she experienced the cranial symptoms, but also in her interpretation of the significance of the Caesarean section. She demonstrated the distortion of reality through autistic thinking.

CONCLUSION.

A case has been described in which attacks of subarachnoid haemorrhage from an angioma had been precipitated by emotional stress. The patient was suffering from a paranoid schizophrenia. The way in which the attacks of physical illness exacerbated and modified the abnormal mental state has been analyzed.

I wish to express thanks to Dr. E. Stengel for his assistance in this study, and to Mr. Murray Falconer, F.R.C.S., Director of the Guy's-Maudsley Neurosurgical Unit, for putting at my disposal the results of the neurosurgical examinations.

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Part II.—Reviews

A People's Conscience. By S. GORDON and T. G. B. COCKS. London: Constable & Co., 1952. Pp. 252. 21s.

This book begins with a history of the work of Select Committees of the House of Commons and contrasts their work with that of Royal Commissions.

Further chapters deal with Select Committees between the years 1729 and 1837 on Debtor's Prisons, Police, Chimney-Sweeps, Children in Factories and Transportation.

A chapter of absorbing psychiatric interest is Chapter V, "The Case of the White House at Bethnal Green" (pp. 101-151), in which excerpts from the Select Committee of 1827 dealing with the conditions in private asylums to which certain London Local Authorities sent pauper lunatics are given. The Select Committee ended by advising that the first Local Authority Lunatic Asylum be built.

W. CLIFFORD M. SCOTT.

Le Coma Post-Hypoglycémique dans la Cure de Sakel—Revue Critique et Étude Pathogénique. By FRANÇOIS CLOUTIER. Paris: Editions Gizard, 1952. Pp. 130. 214 references. No price given.

Prolonged or irreversible coma is the gravest and most dramatic of the complications of the insulin coma treatment of schizophrenia. It is responsible for death in 0.4 per cent. of treated cases, and even when it is reversible a proportion of patients recovers only to a state of severe organic dementia. Unexpected remissions occasionally follow the complication, hence some bold workers have aimed to produce hypoglycaemic comas of half-a-day's duration.

Whilst Dr. Cloutier was working with a grant from the Canadian Government he studied 8 accidental cases of the complication at Professor Delay's Clinic in Paris and was led to prepare this short monograph. He prefers the term "post-hypoglycaemic coma" because it does not prejudice the pathogenesis: actually it does just that very thing, because the term implies that hypoglycaemia is not the main causal factor and this implication is by no means proven. The monograph includes a brief critical survey of the literature on the clinical, histological, biochemical and patho-physiological findings. The characteristic clinical feature is the lack of response to administration of glucose: symptoms may persist when the blood-sugar readings are at a normal or even raised level. The signs are varied, but usually include disordered consciousness, hyperpyrexia, parasympathetic and sympathetic anomalies, hypertonus and convulsions. The author believes that the duration of the hypoglycaemic state is of great aetiological importance and he has been impressed by two warning signals: the first insulin coma usually appears early in the treatment, e.g., before the fifth day, and secondly, the day that irreversible coma is going to appear the time between the insulin injection and the onset of coma is short, that is, less than three hours. Post-mortem findings were variable, but tended to be most obvious in the diencephalon: cerebral oedema, cell degeneration of abiotrophic type, vascular changes and neuroglial reactions were all seen but none of the changes was specific.

Dr. Cloutier believes that hypoglycaemia prevents the cerebral neurones from utilizing oxygen, and that succeeding changes in the permeability of the cell membrane hinder the passage of water and electrolytes. In the ordinary course of the treatment such changes are reversible, but in prolonged coma they have gone so far that restoration of the blood glucose level does not reverse the changes. He believes that it is in the framework of the adaptation syndrome of his fellow-countryman Selye that the therapeutic effects of Sakel's treatment are best understood. According to this view the injections produce repeated stress, and are accompanied by marked clinical and biochemical changes analogous to those seen in the alarm reaction. Prolonged coma represents the stage of exhaustion of the organism, and the author believes that his view is supported by the nature of the cerebral lesions and the endocrine reactions.

The prophylaxis of the complication lies therefore in raising the resistance of the organism, hence before beginning treatment the integrity of the pituitary-adrenal system should be tested: adrenal function can be assessed by the response of the eosinophils, lymphocytes, urinary sodium and potassium, and corticosteroid excretion to the injection of 25 mgm. of ACTH. During insulin treatment observation should be kept on the duration of hypoglycaemia, whilst deficits of water, minerals and vitamins should be made up. The treatment of prolonged coma itself should not be drastic, because metabolic imbalance can easily be worsened by panicky blunderbuss interference.

Dr. Cloutier's lucid monograph is well worth reading, because insufficient attention has been paid to this complication. The experience of British workers suggests, however, that the incidence of the condition varies inversely with the experience of the therapist. Where insulin coma therapy is left to the supervision of a junior physician the complication tends to be more frequent, whilst with careful attention to technique the incidence should be of the slightest. Probably a most important warning signal is delayed awakening after the administration of glucose: it is important that the injection on the following day should be appreciably less. Again, the most important single measure in treatment of the complication is to raise the blood-sugar to above normal and to maintain it at that level until recovery is established: the amount of the sugar in the blood may quite easily vary considerably in a few minutes, and it is only by maintaining a high level that one can be certain of providing adequate glucose for brain metabolism.

HUNTER GILLIES.

Psychiatry To-day. By DAVID STAFFORD-CLARK. London: Penguin Books, 1952. Pp. 304. 2s. 6d.

To over-sell psychiatry to an eager public is fatally easy, but it can be said to their credit that few psychiatrists have the panache (Anglice—"the nerve") to feel or look really comfortable in the Jehovah roles cast for them by their publicists. Popular expositions in books, on the screen and stage, and over the air, have understandably selected examples of striking therapeutic successes, and the public's palate has been pleasurably titillated by case-histories of the "something-nasty-in-the-woodshed" genre. The myriad patients against whom the dice were loaded from the moment of their conception rarely figure in such selected material, and then only in the productions of our heavier and gloomier writers. But it is these patients who daily confront us, and our support of these handicapped people, valuable and indeed indispensable as it is, appears pedestrian beside the miracles that the public has been led to applaud. The fault, of course, lies in ourselves: we, or rather those who speak for us, claim too much, and too rarely confess frankly our comparative helplessness.

All this is a preamble to the simple statement that Dr. Stafford-Clark's book in the Pelican series is wellnigh perfect. At last the public has been given a balanced appreciation of the present position of our speciality. The book is written for the intelligent layman, and never insults the reader's intelligence. In limpid scholarly prose the sum of our knowledge and ignorance is made clear. Particularly impressive is the author's objectivity, and nowhere is this better shown than in the realistic and masterly account of psychoanalysis and its place in the general body of psychiatric teaching.

Psychiatrists will be grateful to Dr. Stafford-Clark.

HUNTER GILLIES.

Psychology and the Industrial Worker. By E. G. Chambers. Cambridge: The University Press, 1951. Pp. 190. Price 10s. 6d.

The author is to be praised for the wisdom with which he conducts his scientific approach to the human problems of industry. For example, psychiatrists will like his insistence on a visit to the home of a candidate who seeks vocational guidance.

The worker as a member of society is treated similarly with human understanding. The danger of the remote control of state ownership and of vast trade unions is described as a morale lowering tendency which springs from a loss of personal relationships.

The preface says, "This book is intended primarily for Students of Psychology, and is an attempt to examine the principles underlying the work of the psychologist in the industrial field." So well has this been done that students who are

enlightened by this book in the principles of their subject may be expected, in due course, to enlarge still further our knowledge and understanding of industrial psychology.

It is a pity therefore that the book, on account of its literary style, does not read easily. Though each short sentence is crystal clear, meaningful and apposite, the flow of sentences is halting. Were the emphasis in each sentence so placed that one read on with anticipation, the book would be excellent.

C. E. H. TURNER.

Industrial Psychology. By JOSEPH TIFFIN. London: George Allen & Unwin, Ltd., 1951. Pp. 553. Price 35s.

There is a vitality in this book that can adventure with new techniques and yet appraise the worth of the adventure with utmost caution.

Industrial Psychology is regarded as a tool for the industrial management of technical employees. The tool has many edges.

Numerous and various tests are given and tests for testing the tests. The limitations of industrial psychology are accepted firmly, but are not allowed to dampen enthusiasm.

The book is packed with information. For example, we are told that there is no correlation of I.Q. and job success; that no single test is sufficient for prediction of job success; that tests should not be accepted merely because of logical consideration in the absence of experiments; that, in learning a job, the first improvement is always followed by a plateau before further improvement may be expected; and that in job training it is important to give the employees "systematic and accurate information on the quality of their work."

There are chapters on employee selection and placement, merit rating, the reduction of accidents, the solution of visual problems, on increasing the accuracy of inspection and on improvements in training methods. Psychiatrists would be specially interested in the chapters on "Tests of Personality and Interest" and on "Attitudes and Morale," provided it is remembered that the book only professes to deal with "applications of psychology that have been made in industry."

The book is intended for the "personnel executives" of industry, and for them the full fourteen chapters of the book justify the claim of the publisher's blurb—"It's all explained in Tiffin."

C. E. H. TURNER.

The Diary of a Psychiatrist. By J. T. FISHER and L. S. HAWLEY. London: Medical Publications Ltd., 1952. Pp. 256. Price 16s.

A charming book. Dr. Fisher was sent as a boy to work on his rich father's farm till he was thirteen and began schooling. At forty, after acquiring much wordly knowledge as well, he found his niche as a psychiatrist. And at the age of 87 he reclined on the analyst's couch, "giving voice to his random thoughts" in the presence of a layman, Lowell Hawley, the professional writer of this book.

The book, equally suitable for medical or lay reading, is witty and wise, yet founded on a simple humility. Those who like such a prescription will find the book most endearing. Others will be bored and would be better not to bother with it.

C. E. H. TURNER.

General Theory of the Neuroses. By RUDOLF BRUN. New York: International Universities Press, Inc. London: George Allen & Unwin Ltd., 1951. Pp. 469. Price \$10.00.

Professor Rudolf Brun of Zürich has written a worthwhile book, translated into fluent English by Bernard Miall. The author, who is a biologist, neurologist and psychoanalyst, takes a comprehensive view of the neuroses.

The study of the hereditary, endocrine and diencephalic aspects of his subject is followed by an inquiry into the general biology of the instinctual life, including the inevitable conflict in the personality of one instinct with another: all these, together with Freud's "dynamic, economic and topical standpoints," are related to the same laws, and thus is evolved the "General Theory of the Neuroses."

It is a brave attempt, supported by facts, erudition, clear thinking and personal observations in several fields of research.

Professor Brun strives to show that the findings of psychoanalysis are not fantastic : but the chamber of horrors so ably discovered by Freud does not fit so easily into the scheme of biology as Professor Brun would have us believe. Sadism and anal erotism for example have been banished from the conscious mind as abnormal ; they do not become normal again just because there they are, always found in the unconscious mind. Disease is present everywhere, but we still distinguish it from health. War is found in all quarters of the globe, but we still believe that peace within mankind is the normal state.

Brun also is a little uncomfortable about this, but like Freud blames little children and archaic methods of feeling and thinking. This is questionable. Even dog does not normally eat dog. The normal behaviour of one species is to eat another species not its own. And surely anal erotism is a perversion of some normal erotism, even though the latter has not been adequately described as yet.

These discoveries of Freud need still further digestion before one can absorb the good in them and eliminate the waste. Too facile an inclusion of these matters into a general theory of biology will result in their banishment from the thinking of many normal people, both medical and lay, to whom this book is addressed ; which would be a pity, for the worth of the book is considerable.

C. E. H. TURNER.

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Survival Factors in American Prisoners of War of the Japanese.

The prolonged miserable circumstances of living during 3½ years of imprisonment as prisoners of war of the Japanese have been outlined. An estimated 12,000 of 30,000, or 40 per cent., survived this experience unique in the history of American people. An attempt has been made to state some of the factors that seemed to the writer to influence survival favorably. These factors in summary consisted of a strong motivation for life with persistent exertion of will, good general intelligence, good constitution, emotional insensitivity or well-controlled and balanced sensitivity, a preserved sense of humor a strong sense of obligation to others, controlled fantasy life, courage, successful active or passive resistance to the captors, luck, opportunism, and a few preceding years of military experience. (Author's abstr.)

Survey of Nine Years of Lobotomy Investigations.

The evidence is strong that bimedial lobotomy is superior in treatment of chronic mental illness to either conventional bilateral lobotomy or unilateral lobotomy. The reduction in anxiety, tension, hostility and impulsivity is dramatic; the improvement in initiative and ability to form object relationships, the increased capacity to work and to get along, the recession of psychotic symptoms—all were most significant and important. In group situations, patients who received bimedial operation were more interested in interaction, more alive to group needs, more productive and organized in their activities than patients receiving the other operations. Psychological tests suggest that they made definite gains in abstraction capacity. There was no mortality in the total series of cases. The immediate post-operative morbidity of bimedial surgery was no greater than other operations, and the incidence of untoward complications no greater than for conventional bilateral lobotomy.

For the present, at the Boston Psychopathic Hospital, bimedial lobotomy has replaced standard full bilateral operation in surgical treatment of chronic mental illness.

(Author's abstr.)

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Effect of Breath Holding on Arterial Pressure in Patients with Mental and Emotional Disorders.

The effect of breath holding on arterial pressure in patients with severe neuroses or with manic-depressive, involutional, schizophrenic or senile psychoses is the same as its effect in normal persons. The amount or nature of emotional activity of the brain does not influence the results of the breath-holding test. There is no physiologic evidence that the amount and nature of emotional activity of the brain are important in causing essential hypertension, although clinical experience indicates that emotion may influence the course of that disease. The reactivity of the vasomotor mechanisms to increased blood-carbon-dioxide concentration is normal in the mental conditions discussed here.

(Authors' abstr.)

Desoxycorticosterone Therapy in Certain Psychotic Cases.

Desoxycorticosterone acetate in sesame oil was administered to 21 psychotic patients; sesame oil in the same amounts without the steroid was administered simultaneously to controls

Patients employed in this study had not responded with improvement to earlier therapy with electric shock, or insulin, or both, and psychotherapy.

Twenty-one patients were selected, all of whom were difficult to manage; their disorders were classified as manic-depressive psychoses, schizophrenia (all types), involutional psychoses, and psychoses associated with mental deficiency.

The results of treatment with the steroid were as follows:

Four patients were sent home, having had a remission of disease; a fifth is being prepared for employment; six are employed in the industrial departments of the hospital; seven assist with duties in connection with ward routine. Four (19 per cent.) are unimproved. In all, 17 (81 per cent.) are improved.

Sustained improvement occurred after from six to eight weeks of the desoxycorticosterone therapy.

Patients who served as controls presented very different results; i.e., only 1 returned home, having had a remission of the psychosis; 4 showed improvement; 2 showed moderate improvement; 19 (73 per cent.) were unimproved. In all, 7 (27 per cent.) remained improved.

The results of this study are in agreement with the results the author reported earlier. Larger-scale evaluation of therapy with desoxycorticosterone acetate is indicated.

(Author's abstr.)

Denial of Illness.

1. The incidence of denial of illness was found to be 28 per cent. on investigation of 100 consecutive cases of hemiplegia due to organic disease of the brain.

2. Denial of illness was always associated with an "organic mental syndrome" and occurred in a much higher proportion of cases of left hemiplegia. It also occurred, however, with lesions of the "dominant" hemisphere.

3. Associated phenomena, such as rationalizations, confabulations, duplications, denial of the existence of an extremity, denial of other illnesses, patterns of disorientation, and denial of the patient's illness by others were observed and described.

(Authors' abstr.)

Studies on a Proteolytic Enzyme System in Schizophrenia.

In a study of 96 physically healthy schizophrenic male patients, abnormally high rennin-inhibitor titres were encountered only in those who exhibited the following emotional reaction pattern: (1) chronically low tolerance to frustration; and (2) the rapid or immediate appearance of confusion, obubilation, amnesia, fugue, syncope, or stupor, as dissociative symptoms, in response to the type of external stress which would be conducive to the production of intensely hostile feelings, but which in this syndrome evokes transitory, slight or no recognition of hostility.

It is concluded that these findings indicate a high correlation of immature, dissociative ego defences and an immature pattern of enzyme kinetics in schizophrenia.

(Authors' abstr.)

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Architectonic Distribution of Acetylcholinesterase in the Frontal Isocortex of Psychotic and Non-Psychotic Patients.

The quantitative cytoarchitectonic distribution of acetylcholinesterase has been determined in 17 biopsy specimens of human frontal isocortex obtained during lobotomy for mental illness or intractable pain.

The cytoarchitectonic distribution of acetylcholinesterase was essentially constant. Activity was relatively great in cytoarchitectonic Layer I, the II-IIIa junction, and the midzones of Layers III and V. The intracortical distribution of this enzyme indicates that it is primarily associated with the neuropil, and suggests its localization at the surfaces of conducting structures and synapses.

The mean acetylcholinesterase activity for a given specimen showed great variability, more so among psychotic than non-psychotic patients (persons lobotomized for psychoneurosis or intractable pain). The mean activity was increased in 7 of 12 psychotic patients, as compared with 5 non-psychotic patients. In comparable but contrasting subgroups the range of such cortical acetylcholinesterase activities was higher among five patients with chronic deteriorated schizophrenia than among four patients with psychoneurosis or intractable pain. The possible meaning of these results and their relation to clinical status, medication and anesthesia, previous convulsion therapy and various histopathological findings are discussed. (Authors' abstr.)

Titration of Central-Nervous-System Depression.

A method for the quantitative titration of depression of the central nervous system, based upon the antagonism between a central depressant and a convulsant, is described. By plotting the CD_{50} 's of a stimulant against the corresponding doses of the depressant, three straight lines are constructed for sedation, hypnosis, and general anesthesia respectively. The slopes and the intersects of the lines represent the sedative, hypnotic, and anesthetic potencies of a drug and its minimal hypnotic and anesthetic doses respectively. The depth of the three stages of depression is indicated by its anticonvulsant effect.

The relation of dose to the depressive effect of phenobarbital was determined against convulsions induced by strychnine, picrotoxin, and pentylenetetrazol (metrazol®). No difference was found in the quantitation of central-nervous-system depression with the three convulsants.

Metrazol® was used to study the depressive effect on the central nervous system of pentobarbital, phenobarbital, barbitol, trimethadione, and carbromal (bromodiethylacetylurea). The results indicate the usefulness of these agents for sedation, hypnosis, or general anesthesia. The three barbiturates are more effective agents for producing hypnosis and general anesthesia, whereas trimethadione and carbromal are better drugs for sedation. (Authors' abstr.)

Blood Ketone Concentration in Patients with Mental and Emotional Disorders.

A procedure is presented for the study of the joint effect of central-nervous-system depressants. It is based upon their anticonvulsant activity against metrazol®. Barbitol and pentobarbital were shown to be additive and pentobarbital and carbromal were synergistic in their combined anticonvulsant effect. (Authors' abstr.)

Role of Gelatinous Substance of Spinal Cord in Conduction of Pain.

This study on the gelatinous substance of the posterior gray columns of the spinal cord is based primarily on Golgi preparations of human infants and newborn cats. The gelatinous substance is composed mainly of small multipolar neurons whose processes are limited to that region. The pericolumnal cells are large multipolar neurons scattered in the posterior, lateral, and medial margins of the gelatinous substance. Their coarse, freely branching dendrites spread out in the gelatinous substance. The cells lying under the gelatinous substance constitute the nucleus proprius. The cells lying closest to the gelatinous substance are medium-sized to large multipolar neurons. Their dorsally directed dendrites extend into a rather narrow zone of the gelatinous substance. The deeper cells of this nucleus are often a little larger, and the spread of their dorsal dendrites may include the dendritic zone of several of their dorsal neighbours. The ventrally directed dendrites are lost in the adjacent gray matter. The axons of the above cells could not be followed for any great distance.

Numerous fibers leave the posterior funiculus and Lissauer's zone and enter the posterior gray columns. Many of the coarser fibers circumvent the gelatinous substance by passing on its medial or its lateral side. Many of the finer fibers terminate in the gelatinous substance. Several types of these were observed. One type passes along the lateral or the medial margin of the area and then turns dorsally into the gelatinous substance, where it is lost. Another passes directly through the area and then turns dorsally into the gelatinous substance. Some fibers bifurcate as they pass ventrally. Others divide close to the dorsal margin and send off branches. All these fibers appear to give off the majority

of their terminal branches in the ventral zone of the gelatinous substance. It is in this region that the dendrites of the cells of the nucleus proprius of the dorsal horn are most numerous.

The evidence suggests that small pain-conducting fibers from Lissauer's zone, ending in the gelatinous substance, relay their impulses through one or more intercalated neurons in this substance, to the pericornual cells and to the cells of the nucleus proprius, which, in turn, give rise to the lateral spinothalamic tract. It is unlikely that any fibers of the lateral spinothalamic tract arise directly from the small neurons of the gelatinous substance.

Larger fibers that penetrate or by-pass the gelatinous substance also end in synaptic relation to neurons of the nucleus proprius. Some of these, at least, may be fast pain-conducting fibers of neurons of the first order. In this case the neurons of the nucleus proprius would be of the second order. The probability is that in fast pain conduction not only the coarser fibers but also fewer neurons are involved. (Author's abstr.)

Blood Eosinophiles in Alcoholic States.

Approximately 50 per cent. of a series of alcoholic patients exhibited a decline of 50 per cent. or more in circulating eosinophiles following the subcutaneous injection of 0.3 c.c. 1:1,000 epinephrine hydrochloride. This corresponds satisfactorily with the results obtained by Fisher and Fisher in a group of normal controls. The initial eosinophile counts in these alcoholic patients were chiefly in the "low-normal" range. These data do not confirm the presence of deficient adrenocortical function in alcoholic patients. (Authors' abstr.)

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An Activating System in Brain Stem of Monkey.

Evidence is presented which indicates that there exists in the monkey, as in the cat, a centrally located area comprising the midbrain tegmentum, the subthalamus and hypothalamus, and the medial portion of the thalamus in which evoked potentials can be recorded from peripheral stimuli delivered to the somatic, visual, auditory and visceral systems. Such potentials are similar to those evoked in the lateral sensory pathways, but differ in that they attenuate when rapidly evoked from stimulation of a single sensory nerve and interact when the eliciting shocks are delivered in close approximation to two different sources.

Rapidly repetitive stimuli delivered to the cut sciatic or splanchnic nerves or to the lateral sensory pathways in the brain stem cause an increase in the normally fast background activity throughout the activating system and a simultaneous desynchronization of electrocortical activity. The same cortical desynchronization occurs on high-frequency stimulation anywhere in the reticular activating system and usually persists long after cessation of the stimulus. There is a tendency for such electrocortical activation to be frontally oriented, but it can be observed over the entire hemisphere on stimulation of the most excitable areas in the central core.

The results of these experiments indicate that this centrally situated area in the brain stem, functioning as a unit, is subject to excitation by peripheral sensory stimulation. Such excitation effects electrical activation of the cortex and behavioral arousal of the animal. The evidence suggests that this medially mediated mechanism plays an important role in such physiological reactions to sensory stimuli as awareness of sensation, arousal to wakefulness, or alerting to attention. (Authors' abstr.)

Effects of Chronic Lesions in Central Cephalic Brain Stem of Monkeys.

Electrolytic lesions were made in the central cephalic portion of the brain stem of 9 monkeys; as a control, the operation was performed, but no lesion made, in a tenth

monkey. These experiments were devised to evaluate the effect on behavior and on the electroencephalogram of destruction of the reticular activating system.

Complete destruction of the area was not compatible with survival of the animals. Less extensive lesions resulted in a state of behavioral akinesia and hypersomnolence in the monkeys simulating coma in man.

The electroencephalograms were characterized by hypersynchrony, which was not responsive to sensory arousal stimuli. Animals in which lesions of comparable size were made, but which did not involve the reticular activating system, were not similarly affected.

The extent to which the reticular activating system was involved appeared to influence directly the degree to which the behavior and the electroencephalogram of the animals were disturbed. (Authors' abstr.)

Respiratory Responses to Stimulation of Temporal Pole, Insula, and Hippocampal and Limbic Gyri in Man.

Results of electrical stimulation of the temporal lobe, the hippocampal and limbic gyri, and the insula in man, with recording of respiratory responses, are reported.

From points indicated, inhibition of respiratory movements in expiration was obtained. The responsive points were located in the anterior end of the hippocampal gyrus, the ventral and medial surfaces of the temporal pole, the anterior portion of the insula, and the anterior limbic gyrus. The posterior orbital surface and the subcallosal region of the frontal lobe were not stimulated.

Arrest of breathing was recorded as the initial phenomenon in epileptic seizures induced from these areas.

Associated with the respiratory inhibition there was frequently impaired consciousness, a feeling of tiredness and sleepiness, and a tendency to close the eyes. (Authors' abstr.)

Studies on Blood-Brain Barrier with Radioactive Phosphorus.

The concentration of P^{32} in various parts of the hypophysis and hypothalamus was determined in 12 human subjects, from six hours to three weeks after a single intravenous injection of the isotope.

A larger deposit of P^{32} was found in the pituitary gland, infundibulum and tuber cinereum than in other parts of the brain. Other hypothalamic regions did not differ significantly from the central nervous system.

There was no significant difference in the phosphate uptake of the anterior and that of the posterior lobe of the pituitary gland in the majority of cases. The intermediate lobe, if present, concentrated less P^{32} .

Time curves for P^{32} concentrations of various areas indicate a fundamental difference between the uptake of phosphates by the hypophysis (and other parenchymatous organs) and that of the brain. The tuber cinereum follows the former pattern.

The role of the tuber cinereum and that of the supraoptic and paraventricular nuclei are discussed, with special regard to the correlation between vascularity and metabolism and to the permeability of the blood-brain barrier. (Author's abstr.)

Serum Cholinesterase Activity in Mental Disease.

Serum cholinesterase activity determined by a sensitive and specific colorimetric method could not be correlated with the psychiatric diagnosis, response to therapy, or presence or absence of marked overt depression in a series of 60 hospitalized psychiatric patients. A transient rise in serum cholinesterase activity occurs in a majority of patients subjected to electroshock therapy, and appears to be largely related to transient hemoconcentration. A brief review of the nature and probable origin of the serum cholinesterase suggests that the level of the circulating enzyme could bear no direct relation to the mental state, alleged correlations in some series and pharmacologic studies notwithstanding. (Authors' abstr.)

Effect of Series of Electric Shock Treatments on Cerebral Blood Flow and Metabolism.

Cerebral blood flow and cerebral metabolic studies were done on 21 patients before and after they had received an average of 10 electric shock treatments.

No significant changes in cerebral blood flow or oxygen consumption occurred. Cerebral oxygen consumption fell from 3.7 to 3.3 c.c. of oxygen per 100 gm. of brain ($p = > 0.05$).

Neither clinical improvement nor mental confusion produced by electric shock therapy is associated with changes in cerebral blood flow or cerebral metabolism as measured by present techniques. (Authors' abstr.)

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The Control with Mesontoin of Convulsive Seizures due to Neurosyphilis. Clinical and Electroencephalographic Studies.

1. Eight paretics who had had previous adequate specific antileptic therapy and who had inactive spinal fluids were treated with Mesontoin for convulsive seizures.

2. The mean daily dosage for adequate control of seizures was 0.25 gm., somewhat lower than reported for other types of convulsive seizures.

3. Clinical and electroencephalographic results were uniformly good with dramatic improvement in 2 cases.

4. Seven of the 8 patients developed a skin rash, although small initial doses (0.1 gm.) were administered and increased gradually. The drug had to be discontinued in one patient who developed a septic type of fever while on 0.4 gm. daily.

5. Mesontoin seemed to be as satisfactory as, or even superior to, dilantin sodium for the control of convulsive seizures due to neurosyphilis in the cases reported.

(Author's abstr.)

Mephenesin in the Treatment of Spasticity in Multiple Sclerosis.

1. In 20 of 26 spastic multiple sclerosis patients to whom mephenesin in elixir was administered, slight to marked temporary (30 to 60 minutes) reduction in spasticity was observed. It was shown that the effect of mephenesin on spasticity may be quickly tested in each patient by oral administration of elixir.

2. The administration of suitable doses of mephenesin elixir at the physical therapy hour, and of mephenesin tablets as a maintenance dose over the day, seemed to be useful for treatment of spasticity in 10 of the patients. Some case-histories are given which illustrate three types of spasticities encountered in multiple sclerosis and their response to such treatment.

3. Mephenesin elixir is more effective than mephenesin in tablets or capsules in reducing spasticity of multiple sclerosis, but its action is of shorter duration. Effective dosages of mephenesin may vary widely among different patients. Tablets alone have been useful in only a small percentage of patients.

4. Side-effects are usually tolerable, but the increased weakness produced by reduction of the spasticity in some patients may negate the usefulness of the drug for them.

5. Because of the brief action of the mephenesin elixir, its major benefit, for those multiple sclerosis patients in whom it produces usable relaxation, would seem to be in facilitating the application of physical therapy treatments.

(Authors' abstr.)

Epileptic Clouded States.

1. Most of the patients were diagnosed as having "idiopathic epilepsy," and the majority were severe epileptics who had been subject to seizures (primarily of the *grand mal* type) for many years.

2. The clouded states characteristically developed shortly following one or more convulsive seizures (usually following multiple seizures), which were often precipitated by omission of anticonvulsant medication.

There was a rather high incidence of chronic alcoholism in the series (35 per cent.), and in several instances abrupt withdrawal of alcohol precipitated the seizures and subsequent clouded states.

Abrupt withdrawal of medication or alcohol in epileptic patients is dangerous because it results in a heightened susceptibility to seizures (or *status epilepticus*) and an accompanying predisposition to the development of clouded states.

3. The clinical picture of the clouded states was essentially that of a delirium with liberation of aggressive or self-destructive impulses. The chief features of the mental status were confusion, excitement, hallucinations and delusions. There was a relatively high incidence of suicidal attempts, which were primarily impulsive in nature.

4. Although many patients were uninhibited in their behaviour they were usually not considered very dangerous to others, since their mental faculties were generally so disorganized that they were unable to carry out integrated or well-planned aggressions.

5. In the majority of cases the psychosis cleared spontaneously in less than one week. However, in several cases the psychosis persisted for a more extended period and occasionally lasted a month or more.

6. In the few cases having repeat E.E.G.'s, it was observed that there was greater E.E.G. abnormality during the clouded state than after recovery. These changes are analogous to the transitory E.E.G. disturbances observed in other types of delirium.

(Author's abstr.)

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Mephenesin in Anxiety-Tension States.

1. Mephenesin acts on internuncial neurons, producing muscle relaxation without hypnotic effects. Thirty neurotic patients who were experiencing anxiety-tension symptoms (uneasiness, restlessness, muscle tension, psychic tension) received 1 to 2 gm. of the drug one to four times a day as an adjunct to brief psychotherapy.

2. In 26 patients relaxation of tense muscles, leading to a feeling of reduced muscle and psychic tension, often with a sense of well-being was produced. Consciousness, alertness and voluntary action were not effected. There was decreased need for barbiturate sedation for sleep, and of alcoholic beverages for relief of tension.

3. Four cases, all characterized by non-appreciation of increased muscle tension, obtained no benefit. Two of the four got intensification of feelings of nausea, irritability and uneasiness. These were the only side-effects observed in the entire series.

4. Mephenesin relieves anxiety and preoccupation with its bodily manifestations which impede psychotherapy. It can help produce initial improvement, which may be a powerful impetus to further treatment.

5. Mephenesin is useful for relief of anxiety-tension symptoms without producing drowsiness in cases where there is direct awareness of increased muscle tension.
(Author's abstr.)

Frontal Lobe Surgery in the Treatment of Pain: with Consideration of Post-operative Psychological Changes.

The results in terms of the relief of pain following bilateral leukotomy, bilateral lower quadrant leukotomy, unilateral leukotomy, and orbital gyrectomy are described.

Following bilateral leukotomy in 6 patients severe psychological changes were noted which consisted largely of deterioration of the patients' behavior and impaired judgment. These were most severe immediately following operation, improving with the passage of time. Two patients followed for twenty-three and eighteen months are reported.

Following bilateral lower quadrant leukotomy in 9 patients, apathy was the predominant feature noted immediately post-operatively, and, although there was improvement with the passage of time, in the one patient followed for thirty-six months, it was still a predominant feature.

Following unilateral leukotomy in 19 patients the psychological changes noted were on the whole slight in degree and, as with the previous groups, improved with the passage of time. The changes most frequently noted were slight flattening of affect, inappropriate affect, decrease in the amount of spontaneous speech, decrease in the rate of speech in words per minute, and increase in the time interval prior to responding to the interviewer's questions.

Patients leukotomized for pain seem to suffer more mental deficit than those leukotomized for psychosis.

A theory is promulgated to explain the neurophysiological effect of leukotomy in reducing pain.
(Authors' abstr.)

Influence of Prefrontal Lobotomy on Social Interaction in a Monkey Group.

A colony of 6 *Macaca mulatta* monkeys was observed for 3 months before prefrontal lobotomy of 3 of its members and for 7 months after.

Before lobotomy a rigid dominance hierarchy was established on the basis of learned avoidance responses. After lobotomy the stability of the hierarchy was lost because of the marked diminution of the learned avoidance responses in operated low status animals, with an increase in upwardly directed aggression, and a tendency to upward mobility in the hierarchy. This stimulated retaliation by threatened upper status animals, with the ultimate effect of increasing downwardly directed aggression throughout the group. The social structure was not reconstituted in its original form, because of the impaired ability of low status animals after lobotomy to relearn avoidance responses appropriate to their relative position in the hierarchy.
(Authors' abstr.)

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1. Biochemistry, Physiology, Pathology, etc.

Mode of Blocking of Axonal Activity by Curare and Inhibitors of Acetylcholinesterase. Grundfest, H., et al. [*Nature*, **169**, 190 (1952).]

Various solutions were injected, usually 0.5–5 c.mm., directly into the giant axon of the squid, *Loligo pealii*, by means of a special micropipet. Both prostigmine and eserine blocked axonal activity, as did stilbamidine and d-tubocurarine. Acetylcholine chloride also blocked activity of the axon. The relatively powerful acetylcholinesterase inhibitors, eserine and prostigmine, were required in larger amounts than the less potent inhibitors, stilbamidine and d-tubocurarine. Contrary to Grundfest (1st Conference on Nerve Impulse, 1951, 39 (Josiah Macy, Jr., Foundation N.Y.) the "receptor protein" is not acetylcholinesterase. Axon activity is dependent on co-ordinated functioning of "receptor protein," esterase, and acetylcholine. W. DONALD GRAHAM (Chem. Abstr.).

Pseudocholinesterase Activity in the Central Nervous System. Ord, Margery G., and Thompson, R. H. S. [*Biochem. J.*, **51**, 245–51 (1952).]

Substrates used were: acetylcholine chloride (ACh); acetyl- β -methylcholine chloride (MCh); benzoylcholine chloride (BCh); butyrylcholine chloride (BuCh). Relative cholinesterase activities of different regions of the human and mammalian brain were determined on these substrates. All areas displayed a measurable degree of hydrolysis of BCh and BuCh (but not of MCh), in addition to their true cholinesterase. The enzyme is distinct from tributyrinase, as can be seen from its sensitivity to inhibition by eserine and by diisopropyl fluophosphate. The enzyme in human nervous tissue which hydrolyzes BCh is probably a butyrylcholinesterase resembling the pseudocholinesterase in human plasma, and it is found in significantly larger amounts in the white fiber tracts of the cerebrum than in the gray matter. S. MORGULIS (Chem. Abstr.).

Methodology of Total Protein Determination in Cerebrospinal Fluid. Bauer, Helmut, et al. [*Klin. Wochschr.*, **30**, 277–9 (1952).]

The Kafka, biuret and sulfosalicylic acid methods were compared. While the first two methods showed agreement, the third did not seem reliable.

ERICH HEFTMANN (Chem. Abstr.).

Paper Electrophoresis of Cerebrospinal Fluid. Bucher, Theodor, et al. [*Klin. Wochschr.*, **30**, 325–30 (1952).]

Cerebrospinal fluid (I) is concentrated by precipitation with Me_2CO at low temperature before electrophoresis. The pherograms from normal (I) differed from serum pherograms qualitatively in having two additional bands, one before the albumin peak, the other after β -globulin. Pathological specimens of (I) showed increases or decreases in certain bands.

ERICH HEFTMANN (Chem. Abstr.).

Microchemical Investigation of Cations and Anions in Spinal Fluid. Berisso, B., and Bruno, A. [*Pubs. Inst. Invest. Microquim., Univ. Nacl. Litoral (Rosario, Arg.)*, **14**, 109–17 (1950).]

Previously the determination of the number of anions and cations in a specimen of spinal fluid required from 0.5 to 5 ml. of sample per ion. The microchemical tests here suggested for Na, K, Ca and Mg ions require one drop for each ion to be identified. For Na a modified K pyroantimonate method is recommended. Ten grammes of very finely pulverized K pyroantimonate is placed in an amber-colored bottle containing 100 ml. of water and shaken vigorously for several minutes. On standing, a clear layer separates. To perform a Na test, transfer 1 drop spinal fluid to a slide and add 1 drop pyroantimonate reagent. Heat gently over an alcohol lamp and cover with cover-glass when cool. Na is indicated by the formation of typical cigar-shaped crystals, singly and in rosettes (sensitivity, 1 %). To detect K, which normally varies between 0.10 and 0.14 parts per 1000, Berisso and Bruno modified the chloroplatinic acid test with a 5 per cent. aqueous solution of the hexahydrate. Add 1 drop of 1:2 HNO_3 to a drop of spinal fluid on a slide. Cau-

tiously heat over an alcohol lamp to remove excess acid and then, by means of a Pt wire or fine glass needle, apply 1 drop reagent to the edge of the preparation. In the zone of contact the presence of K causes formation of a series of lemon-yellow microcrystals, usually octahedra. The test will detect 0.01 γ . If the fluid tested has been concentrated this procedure is not recommended because the resulting microcrystallized powder is difficult to characterize. Behrens' triple nitrite can also be applied to spinal fluid. For this, Berisso and Bruno prepared a reagent by dissolving NaNO_2 20, $(\text{AcO})_2\text{Cu}$ 9.1, and $(\text{AcO})_2\text{Pb}$ 16.2 gm. in 150 ml. of water and 2 ml. AcOH . Since NH_4 , Rb, Cs and Tl ions are never present in spinal fluid, both of these tests are specific for K. The most desirable method for detecting Ca is one devised by Martini. The slide must be thoroughly cleaned in concentrated NaOH solution, well washed with water, rinsed with alcohol, and dried with a cloth. Then place a drop of spinal fluid on the slide and, after evaporation, add a droplet of collodion by means of a glass rod 2 mm. in diameter. Let the solvent evaporate and then place a drop of H_2SO_4 or concentrated Na_2SO_4 solution on the collodion film. Within a few seconds examine microscopically. Ca should result in formation of colorless prisms (sensitivity, 0.04 γ). Mg can be detected by treating an evaporated test drop of fluid with a drop of 20 per cent. CsCl and a few minute particles of Na phosphate. Drop a cover-glass on the preparation and observe under the microscope. Mg is revealed by the appearance of characteristic colorless tetrahedra (sensitivity, 0.01 γ).

HAROLD F. SCHAEFFER (Chem. Abstr.).

The Quantity of Pyruvic Acid in the Cerebrospinal Fluid. Fujii, Michio (Mie Med. Coll., Tsu). [*J. Mie Med. Coll. (Japan)*, 2, No. 1, 27-42 (1951); cf. *Rinsho Nai-ka Shonika (Clinic for Internal Med. and Pediatrics)*, 4, 100 (1949).]

The pyruvic acid content (I) of the cerebrospinal fluid of patients with brain syphilis, encephalitis, cerebrospinal meningitis, nephritis, epilepsy and focal infections is above normal (1 mgm./dl.). The increase is correlated with the positive urine reaction of Sawada (II) (cf. *Sogo Igaku (Synthetic Med. Sci.)*, 4, 271; or *Igaku No Azumi*, 2, 85 (1947)). Vitamin B_1 , 15 mgm., injected into the carotid or subarachnoid cavity of these patients on alternate days for varying periods (1-8 injections), produced no decrease in (I) and was almost completely excreted in 2 hours. Subcutaneous administration of vitamins B_2 , B_6 and C simultaneously had no effect on either (I) or (II). Intravenous injection of 20 ml. EtOH had no effect on (II).

WALTER FRAJOLA (Chem. Abstr.).

Alkaline and Acid Phosphatase in Cerebrospinal Fluid. Data for Normal Fluids and Fluids from Patients with Meningitis, Poliomyelitis, or Syphilis. Colling, K. G., et al. [*Can. J. Research*, 28E, 56-68 (1950).]

Alkaline and acid phosphatases were significantly increased in the spinal fluids from patients with meningitis or poliomyelitis, but not in the fluids from patients with syphilis. The alkaline phosphatase activity was correlated with both the concentration of protein in the spinal fluid and with the white cell count, whereas the acid phosphatase was correlated with neither. Phosphatase was measured by a modification of the method of King and Armstrong. Carbonate-bicarbonate buffer pH 9.8 was used for the determination of alkaline phosphatase, and citrate buffer pH 4.9 was used for acid phosphatase. To a 15 ml. centrifuge tube was added 2 ml. buffer (either pH 9.8 or 4.9), 2 ml. 0.01 M disodium phenyl phosphate, 0.5 ml. 0.01 M magnesium chloride, 0.2 ml. cerebrospinal fluid, 0.3 ml. distilled water. After incubation for 18 hours at 37°, 1.8 ml. Folin and Ciocalteu reagent (diluted 1:3) was added and the tube was centrifuged. The phenol in 4 ml. of the supernatant was determined as described by King and Armstrong. For a blank, the substrate, buffer and MgCl_2 were incubated alone and the cerebrospinal fluid was added just before the phenol reagent. Results were recorded as γ of phenol liberated by 100 ml. cerebrospinal fluid in 1 hour. For the alkaline phosphatase the mean activities for normal, meningitis, poliomyelitis, syphilis (— C.S.F. Wassermann), syphilis (+ C.S.F. Wassermann) cerebrospinal fluids were: 38, 608, 98, 33, 73. For acid phosphatase the values in the same order were 5.5, 476, 71, 12.9, 12.5.

IRVING SERLIN (Chem. Abstr.).

Determination of Cerebrospinal-fluid Protein with the Folin Phenol Reagent. Daughaday, William H., et al. [*J. Lab. Clin. Med.*, 39, 663-5 (1952).]

The Folin phenol reagent used with Cu has been adapted to the determination of protein in 0.2 ml. of cerebrospinal fluid. The method is more reproducible and is less liable to error than the sulfosalicylic turbidimetric method.

EDWARD J. VAN LOON (Chem. Abstr.).

Sodium and Potassium Concentration in Human Cerebrospinal Fluid. (I). Normal Values. Shaw, Carleton W., et al. [*J. Lab. Clin. Med.*, 38, 574-6 (1951).]

The Na and K concentration in normal human cerebrospinal fluid was determined by using flame photometry and standard chemical methods. Agreement was good between the two procedures and with the literature.

CARTER D. JOHNSTON (Chem. Abstr.).

Cerebrospinal Fluid Pressure and Cerebral Circulation as Related to Headache and Vomiting : I. Relations between the Cerebrospinal Fluid Pressure and Cerebral Circulation. Saisho, Atsushi. [*Folia Pharmacol. Japon.*, **48**, 100-8 (1952).]

Adrenaline at first increased the pressure as well as the blood flow in the brain and later caused a decrease. The extent and duration differed with the dosage. Inhalation of Et₂O increased the cerebral blood flow and the cerebrospinal pressure. BaCl₂ caused a transient increase of the pressure and blood flow, but later it decreased markedly the blood flow, while the pressure was decreased slightly. Acetylcholine also increased both the pressure and the blood flow. Generally the extent of a rise of the pressure was proportional to the increase of the blood flow, but the latter decreased out of proportion to the pressure. S. KITAOKA (Chem. Abstr.).

Cerebrospinal Fluid Pressure and Cerebral Circulation as Related to Headache and Vomiting : II. Saisho, Atsushi. [*Folia Pharmacol. Japon.*, **48**, 133-40; *Breviaria*, 7 (1952).]

Histamine, antipyrine, sulpyrine and apomorphine increased the cerebral blood flow and raised the fluid pressure. Agroclavine (an alkaloid from cultivated ergot) increased both slightly, but soon caused a marked decrease. An intravenous injection of caffeine (10 mgm.) increased both, but a subcutaneous injection of the same size caused a decrease. There was no relation between vomiting and the blood flow and cerebrospinal fluid pressure. S. KITAOKA (Chem. Abstr.).

Effect of Procaine on the Colloidal Gold Test in Cerebrospinal Fluid. Kercher, Grace. [*Am. J. Clin. Path.*, **22**, 812-13 (1952).]

Procaine may cause some precipitation of the Au, but the reaction is almost immediate rather than during the course of 24 hours as when caused by pathological spinal fluids. JOHN T. MYERS (Chem. Abstr.).

Iontophoresis and the Calcium Fractions of Serum and Cerebrospinal Fluid. Baggio, G. C. [*Acta paediat. latina (Parma)*, **3**, 231-41 (1950).]

In 14 children subjected to Ca transcerebral iontophoresis (controls with Na iontophoresis) the total Ca and proteins of serum and all Ca fractions of cerebrospinal fluid were unchanged, but the active Ca of serum increased from average 3.86 to 4.70 mgm. per cent. and the inactive ultrafiltrable Ca decreased correspondingly. Sleep was also induced, nearly proportionally, to the active Ca increase. C. SCANDURA (Chem. Abstr.).

The Passage of Streptomycin from Blood to Cerebrospinal Fluid. Interim Results of Treatment of Tuberculous Meningitis with Streptomycin. Lassen, H. C. A., et al. [*Ugeskrift Laeger*, **110**, 1069 (1948) (in Danish); *Abstracts World Med.*, **5**, 760 (1949).]

The human blood-brain barrier is not impermeable to streptomycin. Curves obtained in 4 cases show that with streptomycin in the blood it is also present in cerebrospinal fluid (C.S.F.), although in lower concentrations. With intramuscular injections of 100 mgm./kgm./day, concentrations in the C.S.F. were 10-30 times those lethal to tubercle bacilli *in vitro*. W. C. TOBIE (Chem. Abstr.).

Active Calcium of Cerebrospinal Fluid (C.S.F.) in Spasmophilia. Gaburro, D. [*Acta paediat. latina (Parma)*, **3**, 223 (1950).]

The active Ca fraction of C.S.F. in 16 cases of spasmophilia, with or without tetanic symptoms, was normal; the ratio of active Ca of C.S.F. to active Ca of blood was nearly doubled. A criticism of the ultrafiltration origin of C.S.F. is given.

C. SCANDURA (Chem. Abstr.).

d-Lysergic Acid Diethylamide and the Mental Disturbances of Ergotism. Delay, J., et al. [*Compt. rend. soc. biol.*, **145**, 1609-10 (1951).]

Although it has not been shown to be present in ergot, the compound in extremely small doses produces in human subjects the same mental disturbances as seen in ergot poisoning. L. E. GILSON (Chem. Abstr.).

Symposium on Fate and Mechanism of Action of the Barbiturates. Distribution and Fate of Dialkylbarbiturates (in the Body). Maynert, E. W. [*Federation Proc.*, **11**, 625-31 (1952).]

A discussion with 26 references.

Physiological disposition and Chemical Fate of Thiobarbiturates in the Body. Brodie, Bernard B. [*Federation Proc.*, **11**, 632-9 (1952).]

The distribution of thiopental (I) in the tissues of the dog after administration of rather large doses showed concentrations 3-4 times as high in the fat as in liver and brain. After intravenous injection of up to 4 gm. in man, (I) disappears rapidly from the plasma for 2-3 hours, then more slowly. (I) is almost completely metabolized in man; only

about 0.3 per cent. of the dose is found unchanged in the urine. From 10 to 25 per cent. is excreted as an unidentified metabolic product with an ultraviolet absorption curve identical with that of (I), but with an acidity like that of a carboxylic acid. Probably a side chain C is oxidized to COOH, leaving the ring intact.

In vitro Metabolism of Barbiturates. Shideman, F. E. [*Federation Proc.*, **11**, 640-6 (1952).]

A review with 26 references.

Relations between Clinical Effects of Barbiturates and their Neurophysiological Mechanisms of Action. Wilker, Abraham. [*Federation Proc.*, **11**, 647-52 (1952).]

A discussion with 28 references.

Enzymic Aspects of Barbiturate Action. Bain, J. A. [*Federation Proc.*, **11**, 653-8 (1952).]

The possible action of barbiturates on energy-transferring systems in cells is discussed.
L. E. GILSON (Chem. Abstr.).

Renal Function during Emotional Diuresis. Miles, B. E., et al. [*Am. J. Med.*, **12**, 659-66 (1952).]

A marked H₂O, Na and Cl diuresis occurred in a hypertensive woman in response to emotion. Also, glomerular filtration increased and reabsorption of H₂O and salt decreased.
BARBARA R. MURRAY (Chem. Abstr.).

Further Studies of Blood Cholesterol in Schizophrenia. Nadeau, Guy, et al. [*Can. Med. Assoc. J.*, **66**, 320-3 (1952); cf. *ibid.*, **62**, 581 (1950).]

Blood cholesterol levels of 10 schizophrenic patients dropped markedly during a 10-week period of increased physical activity and remained low for some weeks afterward. Variability of cholesterol levels was greater than in the pre-experimental period.

W. DONALD GRAHAM (Chem. Abstr.).

Glucose Metabolism in Anxiety States. Cera, L. J., et al. [*Can. Med. Assoc. J.*, **66**, 366-71 (1952).]

A group of psychoneurotic patients showed greater than normal tolerance for glucose administered orally or parentally. Their blood-sugar levels dropped in the normal manner after insulin, but the subsequent hyperglycemic response to oral glucose was subnormal.

W. DONALD GRAHAM (Chem. Abstr.).

Glucose, Glutamate, and Succinate Oxidation in Brain. Harris, H., et al. [*Nature*, **168**, 914-15 (1951).]

Minced guinea-pig brain tissue respiring alone in a Krebs phosphate-Ringer solution (I) loses its ability to oxidize glucose (II) rapidly, but suffers only a slight impairment in its ability to oxidize glutamate (III) or succinate (IV). The increase in O uptake of the system respiring in (I) following (II) addition bears a relationship to the prevailing rate of respiration at the time of (II) addition, but the increase following addition of either (III) or (IV) seems to be independent of the prevailing rate. The increase in O uptake following the addition of (III) to a preparation respiring in (IV) indicates that the mechanisms involved in the oxidation of (III) to α -ketoglutarate and (IV) are not inhibited by the concentration of (IV) used. That (II) is not oxidized in the presence of either (III) or (IV) (these findings are incompatible with those of Weil-Malherbe, *C.A.*, **30**, 7190³) indicates that this phenomenon may represent a mechanism by which the rate of (II) oxidation in brain is regulated.

L. R. (Chem. Abstr.).

Phosphoamidase Activity of Rat Brain. Tseitlin, L. A. [*Biokhimiya*, **17**, 208-13 (1952).]

Phospholysine is more rapidly decomposed enzymically by rat-brain extracts than by extracts from other tissues. The optimum pH is 7.2-7.4. The structural proteins extracted from brain tissue with Edsall's solution also possess pronounced phosphoamidase activity. Two separate enzymes are probably involved. One of the enzymes is easily extracted by H₂O, is activated by Mg, and inhibited by Ca. The other is firmly attached to the structural proteins and is activated by Ca.

H. PRIESTLEY (Chem. Abstr.).

Somatic Characteristics of Manic-depressive Psychosis. Protopopov, V. P. [*Neuropatol. i Psikiat.*, **17**, 57-64 (1948); *Abstracts World Med.*, **5**, 622 (1949).]

Physiological and pathological aspects are discussed. Injection of adrenaline (I) raises the blood histamine in normal subjects. In mania and melancholia this test is negative, capillary resistance is increased, and dermatographism cannot be obtained. Blood pressure falls only briefly. In catatonia, injected (I) causes a prolonged decrease in capillary resistance and blood pressure. In both mania and melancholia, the average blood sugar (II) is 80-100 mgm. per cent. Injection of 1 mgm. (I) into normal subjects

raises (II) to 130–150 mgm. per cent., falling to normal after 2 hours. In manic-depressive psychosis (II) increases to 160–214 mgm. per cent., with a slow fall over 3–4 hours. The rise is somewhat less in the depressive phase. Response to (I) is greater than to insulin. After intake of 150 gm. glucose (II) is higher by 20–40 mgm. per cent. than in normal subjects. Response to insulin varies greatly from the normal, the arteriovenous difference in (II) is greater than normal, being highest in the manic phase. Lactic acid and protein (especially albumin) in the blood are diminished; urea reaches high normal values. Fat and carbohydrate metabolism are increased.

W. C. TOBIE (Chem. Abstr.).

Substrate and Enzyme Distribution in Cells and Cell Fractions of the Nervous System. Abood, L. G., et al. [Am. J. Physiol., **168**, 728 (1952).]

Grey matter of cortex and white matter of cord of the rat were separated mechanically, homogenized, and cell parts centrifuged into nuclear, mitochondrial, supernatant, and lipid fractions. The cord white fractions represent glial cells; the cortex gray, perhaps 90 per cent. glia and 10 per cent. neurones. Tissues of total homogenates are alike in total N, nucleic acids, and phosphorylated intermediates. White matter is 2 to 4 times richer than gray in inorganic P, triose phosphate, creatine P, and lipid P; gray matter is somewhat richer in hexose 2-phosphate. Enzyme activity, per unit fat-free dry weight, is generally 50 per cent. greater in gray matter than in white, but the distribution in fractions is again similar for both.

E. D. WALTER (Chem. Abstr.).

Oxidative Esterification of Phosphate by Neural Tissue. Abood, L. G., et al. [Am. J. Physiol., **168**, 739 (1952).]

Cord white and cortex gray, especially their mitochondrial fractions, are able to esterify P to adenosine diphosphate and adenosine triphosphate and to glucose 6-phosphate with the aid of oxidative energy. P/O ratios are about 2 uncorrected, 3 corrected for losses due to apyrase, with a variety of substrates. Only succinate gives a corrected ratio of 2. The highest average ratio, nearly 4 corrected, is obtained with glutamate oxidation by cord. These findings are related to the ability of substrates to support neural function.

E. D. WALTER (Chem. Abstr.).

Effects of Various Concentrations of Adrenocorticotrophic Hormone on Electrical Activity of Brain and on Sensitivity to Convulsion-inducing Agents. Torda, C., et al. [Am. J. Physiol., **168**, 406 (1952).]

Prolonged administration of adrenocorticotrophic hormone (ACTH) induced a decrease of sensitivity of rats to pentamethylene-tetrazole. Single injections of ACTH and repeated injections of ACTH given within a few minutes induced an increased electrical activity of brain, causing an increase of voltage, occasional spiking, paroxysmal runs of low-frequency high-voltage waves, and lowering of convulsion threshold of pentamethylenetetrazole. ACTH induced similar effects in non-operated, hypophysectomized, adrenalectomized, and Na-injected nonoperated animals. Prolonged administration of ACTH in relatively large concentrations induces a decrease in electrical activity due mainly to shift in electrolytes; ACTH in either a single injection or injections repeated within a short period of time induces an increased activity and hyperexcitability of the brain by a mechanism that is not dependent on the presence of the adrenal cortex.

E. D. WALTER (Chem. Abstr.).

Creatine Phosphate in the Brain. Alekseeva, A. M. [Biokhimiya, **17**, 119 (1952).]

Creatine phosphate (I) in the brain of rabbits and rats was determined by the new method. About 50 mgm. per cent. of creatine in the brain is combined with P. (I) of the brain is more labile than that of muscle. (I) begins to disappear from the brain immediately after death, and 15 minutes later it is completely absent. In analysis the rats, while under narcosis, were pushed heads forward into liquid air, and the heads then chopped off.

H. PRIESTLEY (Chem. Abstr.).

Histochemical Studies on the Changes of Tissue Phosphatase Caused by the Electrical Stimulation of Autonomic Centers. Kurotsu, T., et al. [Med. J. Osaka Univ., **2**, 163–76 (1951) (in English).]

The acid and alkaline phosphatase activities as demonstrated histochemically in duodenal intestine, liver, and kidney of adult male rabbits were greater than normal 5, 20 and 40 minutes after electrical stimulation of the sympathetic center of the hypothalamus. No change or slight decreases in enzymic activity were produced by stimulation of the parasympathetic center.

WALTER FRAJOLA (Chem. Abstr.).

Responses of Different Nerve-fiber Types to a Deficiency of Sodium. Crescitelli, Frederick, et al. [Am. J. Physiol., **169**, 1–10 (1952); cf. C. A., **43**, 2329f.]

In contrast to nerves with intact sheaths in the bullfrog, desheathed nerves in contact with solutions lacking NaCl lost excitability and the ability to conduct impulses in a matter of minutes. Rapid recovery took place when such excitable nerves were treated with

Ringer solution. The B fibers were most sensitive to a lack of Na, blocking before most of the A fibers and before many of the C fibers. With solutions containing 0.011 M NaCl and B fiber activity disappeared with little loss of A fiber action and with only partial loss of the C responses. Li was the only substance able to substitute for Na in these reactions. The tetraethylammonium ion was incapable of maintaining or of restoring activity in the absence of Na ions.

E. D. WALTER (Chem. Abstr.).

Experimental Hormonal Changes in the Cerebral Circulation. Baruk, H., et al. [Rev. Neurol., **80**, 497-516 (1948); Abstracts World Med., **5**, 742 (1949).]

Hormones were applied directly to the exposed cortex of the brains of animals, and also were injected intravenously. Folliculin injected intravenously caused slight vasodilation. Testosterone caused slight vasodilation in male animals. Acetylcholine produced extensive dilation, and was fatal in large doses. An anterior pituitary hormone preparation (prolan) first constricted the cerebral vessels, then produced a cataleptic condition. The use of hormones in treating psychoses is discussed.

W. C. TOBIE (Chem. Abstr.).

Biochemical Changes in Functional Activity of the Brain. Richter, D., and Dawson, R. M. C. [Abstracts Commun., 1st Intern. Congr. Biochem. (Cambridge, Engl.), 602 (1949); cf. C. A., **43**, 745h; **44**, 1185h.]

By use of radioactive P³² emotional excitement in the rat was shown to decrease the rate of synthesis of phospholipide by 25 per cent.

W. C. TOBIE (Chem. Abstr.).

Tetanic Intoxication and Metabolism of Central Nervous Tissue. Seki, T., et al. [Med. J. Osaka Univ., **2**, No. 2, 55-63 (1951).]

Injection of tetanus toxin (250-30,000 mouse MLD) into rabbits resulted in slight increases in the concentrations of glucose, β -hydroxybutyric acid, acetoacetic acid (I), pyruvic acid, and α -ketoglutaric acid in the blood. More pronounced increases were observed in the spinal fluid. The (I) concentration was five times normal in some animals. No change in acetone concentration was noted in either the blood or spinal fluid. When paralysis decreased, normal values were noted.

W. F. (Chem. Abstr.).

Protein-bound Phosphorus Compounds in Peripheral Nerve during Wallerian Degeneration. Logan, J. E. [Rev. Can. Biol., **11**, 70 (1952).]

The concentration of total nucleic acid in the sciatic nerve of the cat increased after either nerve section (neurotmesis) or nerve crush (axonotmesis). After either type of operation the total nucleic acid reached a maximum in 16 days and then fell gradually. Pentose nucleic acid (PNA) increased more rapidly than desoxyribonucleic acid (DNA), so that there was an increase in the PNA:DNA ratio. The concentration of "phosphoprotein" (orthophosphate liberated by hydrolysis with N KOH at 37° for 18 hours) fell throughout the course of the degeneration in the sectioned nerves, but in the crushed nerves it had commenced to rise by 96 days, and by 250 days it was almost equal to the concentration in the control nerves. The "inositide" P followed a course similar to that previously outlined for the phospholipide. After either type of operation there was little change during the first 8 days, followed by a rapid fall during the period 8-32 days. In the sectioned nerves the "inositide P" fell still further, whereas in the crushed nerves it had commenced to increase by 96 days and continued to rise during the entire period of study. Even 600 days after nerve crush the concentration of nucleic acid was still greater and the concentration of lipide P and "inositide P" was still less than in the control nerves.

A. PAPINEAU-COUTURE (Chem. Abstr.).

Neurogenic Hypoglycemia. Brage, Diego. [1, 616-31 (1952).]

A theoretical discussion supplemented by a few case-reports and 84 references.

A. E. MEYER (Chem. Abstr.).

The Pathology and Biochemistry of Gargoylism. Henderson, J. L., et al. [Arch. Disease Childhood, **27**, 230-53 (1952).]

Three cases are reported, with differential lipid analyses of liver and spleen for one. Values were in the normal range.

KATHRYN KNOWLTON (Chem Abstr.).

The Uptake and Turnover of Phosphate by the Brain. Lindberg, O. H. [Abstracts Commun., 1st Intern. Congr. Biochem. (Cambridge, Engl.), 282-3 (1949).]

Phosphate (labelled with P³²) injected intravenously into rats is taken up only slightly by the brain (owing to the brain barrier), but injected subarachnoidally it is distributed throughout the brain in 2 minutes and remains in nearly constant amount for several hours. Orthophosphate entering the brain in this fashion is very quickly converted into organic compounds (which contain 70 per cent. of the radioactivity after 8 hours). The speed of turnover of adenosine triphosphate, creatine phosphate and adenylic acid was determined to be 40 γ P/min./gm. of brain tissue.

W. C. TOBIE (Chem. Abstr.).

Neurosecretion and Occurrence of Hormones in the Human Midbrain. Hild, Walther, et al. *Klin. Wochschr.*, **30**, 433-9 (1952).]

Vasopressin, adiuretin and oxytocin occur not only in the hypophysis, but also in the hypothalamus. The amount of neurosecretion observed histologically parallels the amount of hormone determined pharmacologically. ERICH HEFTMANN (Chem. Abstr.).

Physiology of Neuromuscular Transmission and Neuromuscular Block. Feldberg, W. [*Brit. Med. J.*, **1**, 967-76 (1951).]

MARSHALL E. DEUTSCH (Chem. Abstr.).

Lipides and Total Nitrogen in Central Nervous Tissues of the Human Fetus. Mihara, T. [*J. Biochem. (Japan)*, **39**, 155-61 (1952).]

In the course of fetal growth from the 2nd to 10th month the contents of lipid fractions and total N were determined. Total N (mgm./100 mgm. dry weight) decreases considerably in cerebrum, spinal cord, and slightly in cerebellum. Total lipid increases markedly except in cerebellum. The increases in lipid fractions are as follows: in cerebrum, cholesterol (I) > cerebroside (II) > phospholipide (III), and among (III)-fractions, sphingomyelin (IV) > cephalin (V), lecithin (VI); in cerebellum only (IV) increases, and (VI) rather decreases; in medulla oblongata (II) > (I) > (III), and of (III), (VI) increases; in spinal cord (II) >> (I) > (III), and (VI) > (IV) > (V).

F. K. ANAN (Chem. Abstr.).

Various Types of Movements Induced from the Chemical Stimulation to the Cortex and other Gray Matters in Central Nervous System. Ito, S. [*J. Physiol. Soc. Japan*, **14**, 12 (1952).]

The injection of a small dose of various chemicals into the gray matter caused the following types of limb movements in dogs: Cortex: tonic convulsion was observed by the application of Na aspartate, clonic convulsion (I) by nicotine, picrotoxin, and Na glutamate, locomotive convulsion (II) by Na citrate. Thalamus: (I) by nicotine and BaCl₂, rigidity (III) by KCl and BaCl₂. Midbrain: (I) by Na oxalate, (II) by Na citrate and Na glutamate, (III) by Na glutamate and KCN. ITIRO TYUMA (Chem. Abstr.).

The Effect of Intermittent Anoxia on the Brain. Lucas, B. G. B., et al. [*J. Path. Bact.*, **64**, 265 (1952).]

Two "anoxic" abnormalities, enlarged pericellular and perivascular spaces, and chronic nerve-cell changes, were found to a greater or lesser extent in 48 normal guinea-pig brains. The chronic nerve-cell change could be associated with post-mortem mechanical injury to the brain, the cells of the cerebral cortex being most vulnerable, and often showing changes when the injury was some distance away. In 40 guinea-pigs subjected to the anoxia changes were detected in 2 animals only. In these there was an acute edematous cell change which was not present in animals allowed to survive for 10 days after the anoxic bouts. In another experiment in which 10 animals received 60 immersions in N within 8 hours no pronounced histological changes were found, although 3 animals showed subjective neurological disturbances for a short time.

JOHN T. MYERS (Chem. Abstr.).

Influence of Steroids on Cerebral Metabolism. Gordan, G. S., et al. [*Ann. N.Y. Acad. Sci.*, **54**, 575 (1951).]

The data demonstrate hormonal, and specifically steroidal control of cerebral metabolism in man and the rat. Measurements were made, by using differences in the composition of the cerebral arterio-venous circulating blood, of cerebral metabolic rates, cerebral utilization of glucose, and the response to desoxycorticosterone glucoside. Human subjects included healthy controls, patients with nonendocrine cerebral diseases, and others with hypopituitarism.

W. H. FISHMAN (Chem. Abstr.).

Change in the Composition of the Adrenal Medullary Hormones by Hypothalamic Stimulation. Brucke, F., et al. [*Arch. intern. pharmacodynamie*, **88**, 407 (1952).]

Stimulation of the hypothalamus in cats increases the secretion of adrenaline but not of noradrenaline. Stimulation of the carotid sinus does not increase either.

M. L. C. BERNHEIM (Chem. Abstr.).

Chemistry of Phosphatides and Cerebrosides. Calmer, W. D., et al. [*Physiol. Rev.*, **32**, 168 (1952).]

The following compounds are discussed: Glycerophosphatides (phosphatidyl choline, phosphatidyl ethanclamine, phosphatidyl serine, acetal phospholipide and cardiolipin); inositol lipides (diphosphoinositides from brain, soybean, and corn oil); sphingolipins (sphingomyelins, cerebrosides, gangliosides, hematoside, strainidin, cerebrin). Sphingo-

lipides, discovered originally as components of nerve tissue, appear to be present in a wide variety of living organisms, and may have an important position in metabolism and function. An interesting substance, extracted from brain by $\text{CHCl}_3\text{-CH}_3\text{OH}$, is a new type of proteolipide which is soluble in organic solvents but not in H_2O . It is found in many tissues but it forms a large component of brain white matter. The compound is easily broken into constituent moieties, the protein no longer being extractable by the $\text{CHCl}_3\text{-CH}_3\text{OH}$ mixture. S. MORGULIS (Chem. Abstr.).

Pathological Lesions in the Nervous System of the Duck Fed a Ration Deficient in Vitamin A. Rigdon, R. H. [Arch. Path., **53**, 239 (1952).]

The primary lesion of vitamin A deficiency in young ducks appears to be degenerative change within the nerve cells themselves, and is not the result of compression of the cord by osseous tissue. M. L. C. BERNHEIM (Chem. Abstr.).

Activity of Acetylcholine System in Cerebral Cortex of Various Unanesthetized Mammals. Tower, Donald B., et al. [Amer. J. Physiol., **168**, 747 (1952).]

The activity of the acetylcholine (I) system per unit weight was measured in sample of cerebral cortex from normal, unanesthetized adult mice, rats, guinea-pigs, rabbits, cats, dogs, monkeys and beef and from human patients. No differences between different cortical areas in the same species were observed. The total (I) content of pieces of cerebral cortex decreased with time after excision. The rate of decrease was the same function of time for all species studied. The decrease depended on the condition of the tissue since excision, and did not occur if the animal had been eserized or if the excised pieces were kept under an increased O tension. All the components of the (I) system measured decreased fairly regularly with ascending order on the phylogenetic scale. This decrease was related to the average total brain weight of each species and was the same function of the brain weight for all types of activity measured. A decrease in the average number of neurones per unit volume of cortex with increasing brain weight ran parallel to the decrease in activities of the (I) system. E. D. WALTER (Chem. Abstr.).

Action of Acetylcholine on the Central Motor System. Ito, S. [J. Physiol. Soc. Japan, **14**, 60 (1952).]

Convulsive effects of acetylcholine (I) on the central nervous systems of dogs were investigated. Application of (I) (concentration above 10 per cent.) to the motor area could induce clonic convulsion, but to any other parts of cortex except motor area (I) showed no effect. Injection of (I) (4 c.c. of 10 per cent. solution) into the carotid artery could not induce any reactions. ITIRO TYUMA (Chem. Abstr.).

Formation and Transformation of Phosphorylcholine in the Synthesis of Acetylcholine in Brain Extracts. Kometiani, P. A. [Biokhimiya, **17**, 108 (1952).]

During the synthesis of acetylcholine (I) from choline by an acetone extract of brain tissue, a difficulty soluble P compound accumulates, which has been identified as phosphorylcholine (II). (I) is obtained in very small yield from (II) by the action of brain extract. (II) in common with adenosine triphosphate, hexose phosphate and thiamine phosphate sensitizes the muscles toward (I). H. PRIESTLEY (Chem. Abstr.).

Effects of Choline, Acetate, and Citrate on the Activity of the Choline Acetylating System of Mammalian Brain. Balfour, W. E., et al. [Nature, **167**, 991-2 (1951); cf. C. A., **43**, 9092e.]

Results from chemical determination of acetylcholine were higher than from bio-assay. Addition of citrate to the enzyme derived from a 16-25 per cent. $(\text{NH}_4)_2\text{SO}_4$ fraction was much more activating than addition of acetate; whereas acetate and citrate have nearly equal effects when a 16-36 per cent. fraction is used. This suggests the existence of two enzyme systems. KATHRYN D. KUCK (Chem. Abstr.).

Effect of Pituitary Hormones, Cortisone and Adrenalectomy on Some Aspects of Neuromuscular Function and Acetylcholine Synthesis. Torda, Clara, and Wolff, Harold G. [Am. J. Physiol., **169**, 140-9 (1952); cf. C. A., **44**, 9547d.]

Hypophysectomized animals showed a marked decrease of the ability of muscle to maintain the amplitude of action potential unaltered during repetitive indirect stimulation of the nerve, and a decrease of the ability of nerve tissue to synthesize acetylcholine. Administration of adrenocorticotrophic hormone (ACTH) restored the ability of the neuromuscular system of hypophysectomized animals to maintain the action potential unaltered during repetitive stimulation. ACTH increased the ability of the brain of non-operated and hypophysectomized animals to synthesize acetylcholine. Cortisone acetate induced qualitatively similar but quantitatively less effect than did ACTH. The ability of the muscle to maintain the amplitude of action potential unaltered during both repetitive indirect and direct stimulation and the ability of the brain to synthesize acetylcholine was not significantly modified by pitocin and pitressin in both non-operated and hypophysectomized animals.

tomized rats. Administration of thyrotropic hormone of the pituitary gland (TSH), thyroxine and growth hormone induced an additional impairment of the maintenance of action potential. A parallelism seems to exist between acetylcholine synthesis and neuromuscular function. The parallelism between neuromuscular function and K content is not complete. It is suggested that the pituitary glands maintain both the ability to maintain the amplitude of action potential unaltered for a period of time during repetitive stimulation and an optimal acetylcholine synthesis through the release of ACTH.

E. D. WALTER (Chem. Abstr.).

Effects of Adrenocorticotrophic Hormone, Cortisone Acetate and 17-Hydroxycorticosterone-21-acetate on Acetylcholine Metabolism. Torda, Clara, and Wolff, Harold G. [Am. J. Physiol., **169**, 150-8 (1952); cf. C. A., **44**, 9547d.]

Prolonged administration of ACTH *in vivo* increased the ability of the brain to synthesize acetylcholine. This increase averaged 60 per cent. in hypophysectomized and non-operated rats, and 20 per cent. in adrenalectomized rats on forced salt intake. Addition of ACTH to choline acetylase *in vitro* failed to increase the activity of the enzyme, suggesting that ACTH increases the synthesis of acetylcholine mainly through an increased relative concentration of enzyme potentiators. The effect of ACTH in increasing acetylcholine synthesis depends on both an adrenal and an extra-adrenal factor. Cortisone and compound F did not fully duplicate the effects of ACTH on acetylcholine synthesis. Hypophysectomy resulted in an average decrease of 50 per cent. of the ability of the brain to synthesize acetylcholine. Adrenalectomy did not significantly impair the ability of brain to synthesize acetylcholine in rats with restricted activity. The activity of acetylcholine esterase was slightly increased after prolonged administration of ACTH and cortisone, and hypophysectomy. The increase was questionable after a single injection of ACTH, cortisone, and compound F. ACTH *in vitro* did not significantly modify the sensitivity of effector cells to chemical stimuli. Cortisone increased the sensitivity of effector cells to chemical stimuli.

E. D. WALTER (Chem. Abstr.).

Effect of Intraventricular (Cerebral) Acetylcholine, Choline Esterase, and Related compounds in Normal and "Catatonic" Cats. Sherwood, Stephen L., et al. [Nature, **169**, 157 (1952).]

Normal cats exhibit agitation and hallucinatory behaviour; they salivate profusely and defecate within a few minutes after injection of 0.5-2 mgm. acetylcholine (I); they become normal within 1 hour. Mecholy (II) and carbachol (III) have a more marked and longer effect. When cats with syndromes identical with human catatonia are repeatedly injected with partially purified cholinesterase (activity: 2 pH units/hr./ml.) they improve after transient remission. (I) produces recruitment in cats paralyzed by erythroidine; antagonists of (I) diminish this effect.

I. Z. ROBERTS (Chem. Abstr.).

Action of Snake Venom on Acetylcholine Synthesis in Brain. Braganca, B. M., et al. [Nature, **169**, 695 (1952).]

Cobra venom, heated to inactivate all the enzymes present except lecithinase, still retained its toxicity to the animal. The heated venom (I) caused a rapid breakdown of bound acetylcholine (II) into the free ester. (I) also caused a pronounced increase in the rate of synthesis of (II) by brain homogenate, the increase being stimulated by the presence of excess K ions. (I) had no inhibitory effect on the acetylation of choline or of sulfanilamide in tissue extracts in the presence of adenosine triphosphate (ATP). It was concluded that a lecithinase in (I) initially affects (II) synthesis in respiring brain homogenates, either by accelerating the rate-limiting step involved in the formation of free from bound (II), or by changing the permeability of the mitochondria for ATP. A decrease in (II) synthesis occurs when, ultimately, the lecithinase brings about a marked diminution in respiratory activity and hence in the rate of formation of ATP.

J. D. TAYLOR (Chem. Abstr.).

Effect of Choline on Neuromuscular Transmission in the Cat. Hutter, O. F. [J. Physiol., **117**, 241 (1952).]

Intravenous injection of 7 mgm. of choline chloride (I)/kgm. into decerebrate or chloralose-anesthetized cats resulted in a brief potentiation of tibialis contractions resulting from single supramaximal nerve volleys applied by the method of Brown and Burns (Proc. Roy. Soc., **B136**, 182 (1949); 14 mgm. doses increased the potentiation and produced a 30-second fibrillation, followed by a transient depression of twitches. Further increases in doses resulted in a prolonged depression after an only momentary potentiation. Close arterial injection of (I) had similar effects, but muscle contraction also resulted. Intravenous injections of (I) restored neuro-muscular transmission in preparations blocked by d-tubocurarine, completely decurarizing in doses of 20 mgm./kgm.; higher doses not only decurarized but also caused neuromuscular block. Close arterial injections produced similar decurarizing effects. End-plate potential records from the gracilis by the method of Brown and Burns (J. Physiol. (London), **108**, 54P (1949)) indicated that this decurarization was accompanied by an increase in the peak voltage and a lowering in the threshold voltage for initiation of propagation response. Effects of intravenous injection of 7 or

15 mgm./kgm. of (I) were greatly potentiated by 0.2 mg. physostigmine sulfate (II), itself having little effect *per se*. Doses of (II) large enough to potentiate responses to single nerve volleys were reduced, however, by 1 mgm./kgm. of (I), with 3 mgm./kgm. doses producing block. (I) may be considered the prototype of quaternary NH_4 compounds, causing neuro-muscular block by depolarization at the motor end-plate. The increase in end-plate potential by (I) may be due to the increased output of acetylcholine from motor nerve-endings.

MORRIS ROCKSTEIN (Chem. Abstr.).

2. Pharmacology and Treatment.

The Effect of Methonium compounds on Nicotine Convulsions. Laurence, D. R., et al. [Brit. J. Pharmacol., **7**, 80-4 (1952).]

Pentahexa- and heptamethonium antagonized nicotine convulsions in mice and rats, while tri- and tetramethonium and Et_4N^+ showed no such antagonism. Hexamethonium did not antagonize convulsions caused by lobeline, leptazol, cocaine, strychnine or picrotoxin.

RICHARD F. RILEY (Chem. Abstr.).

Mysoline: A New Drug in the Treatment of Epilepsy. Handley, R., et al. [Lancet, **262**, 742-4 (1952).]

5-Phenyl-5-ethylhexahydro-4,6-pyrimidinedione was given to 40 patients who were continuing to have major epilepsy despite other forms of treatment. Daily doses of up to 1.6 gm. produced no serious side effects or sleepiness. Attacks were reduced in 80 per cent. and abolished in 30 per cent.

BARBARA R. MURRAY (Chem. Abstr.).

The Changes in Plasma Potassium Level after Adrenaline in Normal Human Beings and in Persons with Epilepsy. Drury, Abraham, et al. [J. Clin. Invest., **31**, 440-4 (1952).]

The changes in plasma levels of K, Na and glucose, at 4, 20, 60, and 120 minutes after intramuscular injection of 0.4 mgm. of adrenaline were determined in a group of normal human subjects and in a group with idiopathic epilepsy. After the adrenaline there was a significant fall in plasma K between 4 and 20 minutes in the epileptic but not in the normal group. The plasma Na was not affected in either group.

JOHN T. MYERS (Chem. Abstr.).

Experimental and Clinical Study of the Action of Paraldehyde on the Central Nervous System, and Especially of its Anticonvulsant Effect. De Elío, F. J., et al. [Rev. Clin. Españ., **30**, 289-95 (1948); J. Neurol. Neurosurg. Psychiat., **12**, 19 et seq. (1949); Abstracts World Med., **5**, 528-9 (1949); Arch. Inst. Farmacol. Exptl. Med. (Madrid), **1**, 5-23 (1949).]

W. C. TOBIE (Chem. Abstr.).

Action of Metrazole on the Central Nervous System in Embryonic and Postnatal Periods of Growth. Tsobrallo, G. I. [Fiziol. Zhur. S.S.S.R., **37**, 727-31 (1951).]

Metrazole causes a stimulating effect on the central nervous system of rabbits. The magnitude of the effect is directly related to the degree of development of function of the nervous system in ontogenesis. The adult reaction is attained at about 50 days of age.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Behaviour of Certain Substances in the Treatment of Convulsions Produced by Picrotoxin and in Cryoepilepsy. Pereira, Nuno Alvares, et al. [Rev. brasil. farm., **32**, 185-92 (1951).]

A suspension of phenylacetylurea in 2 per cent. gum arabic, given orally, protected white rats against convulsions from subsequently administered picrotoxin and against cryoepilepsy induced by cooling of the isolated medulla. Various other synthetic hydantoin derivatives given by injection were not as effective in these cases, but gave satisfactory protection against convulsions from electric shock.

P. Y. JACKSON (Chem. Abstr.).

The Functional Importance of the Quaternary Nitrogen Atoms in Flaxedil: A Study in Structure-activity Relations. Pelikan, Edward, et al. [J. Pharmacol. Exptl. Therap., **104**, 354-62 (1952).]

The effects of 2,6-bis-(diethylaminoethoxy)benzophenone-di-EtI (I) and flaxedil on neuromuscular transmission were qualitatively indistinguishable from those of tubocurarine. In frogs, rabbits, mice and dogs (I) was more potent than flaxedil in producing neuromuscular block but less potent than tubocurarine. In doses equipotent on skeletal muscle (I) was more potent than flaxedil in preventing the effects of vagus stimulation on the heart. The onium groups in the 1 and 3 positions on the benzene ring are responsible for the curare-like action of flaxedil. It is suggested that the quaternary N atom in the 2 position has the chief function of maintaining the onium groups in 1 and 3 positions at a distance from each other nearly optimal for curarizing activity. The electrically charged atom may have only a steric or space-occupying function in the drug molecule. An

electrically neutral group such as the benzoyl group of (I) may have a similar or even greater effect by virtue of intramolecule steric hindrance.

L. E. GILSON (Chem. Abstr.).

Metabolic Demethylation of Mesantoin. Butler, Thomas C. [*J. Pharmacol. Exptl. Therap.*, **104**, 299-308 (1952).]

After administration of mesantoin to dogs and to human subjects, nirvanol was isolated from the urine. Demethylation of mesantoin is substantially complete in the dog. The optical isomers of nirvanol are excreted in unequal amounts. In dog urine there is a slight preponderance of the 1 isomer and in human urine it is largely the 1 isomer. The extent is discussed to which the therapeutic and toxic effects of mesantoin can be attributed to the nirvanol produced from it. The ultraviolet-absorption curves, solubilities, and other physical properties of mesantoin and nirvanol are given.

L. E. GILSON (Chem. Abstr.).

Biochemical Factors Related to Convulsions. Richter, D., et al. [*Abstracts Commun.*, 1st Intern. Congr. Biochem. (Cambridge, Engl.), 181 (1949).]

Electric-shock treatment or convulsant drugs cause liberation of free NH_3 in the brain. No NH_3 appears in the cerebrospinal fluid of epileptics when the decomposition of glutamine is prevented. Acetylcholine is usually high before epileptiform seizures, but decreases rapidly during convulsions.

W. C. TOBIE (Chem. Abstr.).

Changes in Glycogen and Lactate in the Central Nervous System during Convulsions. Chance, M. R. A. [*Abstracts Commun.*, 1st Intern. Congr. Biochem. (Cambridge, Engl.), 603 (1949).]

Nervous tissue contains 0.075-0.25 per cent. glycogen (I). The amount increases in convulsions caused by drugs, electrical stimulation, or lack of O. If these procedures are not applied in an intensity sufficient to cause convulsions, the concentration of (I) is not affected. The amount of lactate varies in response to several factors affecting central nervous activity.

W. C. TOBIE (Chem. Abstr.).

Inactivation of Convulsants by Hexachlorocyclohexane. Herken, Hans, et al. [*Arch. exptl. Path. u. Pharmacol.*, **215**, 217-30 (1952).]

Hexachlorocyclohexane (I) prevents the generalized convulsions produced by metrazole, picrotoxin, or nikethamide. Because the convulsive effects of these three analeptics can be differentiated, it indicates that the same functional areas of the central nervous system are not involved. The effects of (I) are probably mediated outside the spinal cord, for the convulsion-inhibitory action disappears after supratentorial decerebration. The characteristic fibrillatory and fasciculatory twitchings of muscles produced by prostigmine is influenced by (I), but not those produced by physostigmine. This difference is not due to anticholinesterase activity, but more likely to differences in the central effects of these two drugs. A new method is thus available to differentiate the effects of convulsants by means of chemical blockade of certain brain functions with the isomeric hexachlorocyclohexanes.

C. J. CARR (Chem. Abstr.).

Anticonvulsant Action of Methylparafynol (Dormison). Schaffarzick, R. W., et al. [*Stanford Med. Bull.*, **10**, 106 (1952).]

Methylparafynol (3-methyl-1-pentyn-3-ol) is of low toxicity, has hypnotic action, and prevents convulsions in animals and man. The effective anticonvulsant dose orally in rats is 48 mgm./kgm., the ataxia-producing dose 102 mgm./kgm., and the sleep-producing dose is 250 mgm./kgm. One hundred and fifty mgm./kgm. dosage shows anticonvulsant action, as measured by reduction of the tonic-extensor phase of supramaximal seizures, for 8 hours or more. When given with phenobarbital there is potentiation of their combined anticonvulsant actions. Six patients with epilepsy have been treated with 250 mgm. four times daily. Good control was obtained in 4, one was worse, and one had too short treatment. Some irritability and insomnia were noted during 5 weeks on the drug.

RUSSEL O. BOWMAN (Chem. Abstr.).

A New Curare Antagonist in Electroshock Therapy and in Clinical Anesthesia. Faulconer, A., Jr., et al. [*Neurology*, **2**, 226 (1952); *Collected Papers Mayo Clinic and Foundation*, **43**, 679-87 (1952).]

Electromyographic studies revealed that maximum change occurs approximately 5 minutes after intravenous administration of curare, that the normal recovery time is in excess of 30 minutes, that intravenous administration of 0.5 mgm. prostigmine 5 minutes after curare accelerates recovery very slightly, that administration of 2.5 mgm. tensilon for each 3 mgm. curare 5 minutes after curare produces in less than 90 seconds a substantial return of the muscle action potential which is maintained satisfactorily, and that electromyographic restoration of function is accompanied by clinical manifestations of decurarization.

H. L. MASON (Chem. Abstr.).

Protection Afforded Mice by Some Anticonvulsants. Radouco, C., et al. [*Arch. sci. (Soc. phys. hist. nat. Geneve)*, **4**, 408 (1951).]

The protective effect of various anticonvulsants has been determined against lethal doses of strychnine sulfate. A therapeutic index (I) has been calculated which represents the ratio of the dose required to kill 5 per cent. of the animals to the dose required to protect 95 per cent. The highest (I) was obtained with a mixture of phenylethylacetylurea (II) and phenylacetylurea (III), followed by (II) alone, dimethyldithiohydantoin (thio-medan), phenylethylmalonylurea (phenobarbital), ethylphenylmethylhydantoin (mesantoin), trimethyloxazolidinedione (tridione) and (III) alone.

H. I. CHINN (Chem. Abstr.).

Effect of Adrenocortical Steroids and Adrenocorticotrophic Hormone (ACTH) on Electroshock Seizure Threshold (EST). Woodbury, D. M., et al. [*J. Pharmacol. Exptl. Therap.*, **105** (1952).]

Daily injection of a small dose of desoxycorticosterone acetate, 11-desoxy-17-hydroxycorticosterone acetate (compound S), or ACTH elevated the EST of rats. Corticosterone acetate had no significant effect. The EST was slightly lowered by 11-dehydrocorticosterone acetate, considerably lowered by 17-hydroxycorticosterone acetate (compound F), and markedly lowered by cortisone acetate.

L. E. GILSON (Chem. Abstr.).

Effects of Chronic Anticonvulsant Administration on Cortisone-induced Brain Hyperexcitability. Fingl, E., et al. [*J. Pharmacol. Exptl. Therap.*, **105**, 37 (1952).]

Repeated administration of diphenylhydantoin or barbiturates raised the cortisone-lowered threshold to electroshock seizures in rats.

L. E. GILSON (Chem. Abstr.).

Effects of Chronic Administration of Anticonvulsant Drugs, Alone and in Combination with Desoxycorticosterone, on Electroshock Seizure Threshold (EST) and Tissue Electrolytes. Woodbury, D. M., et al. [*J. Pharmacol. Exptl. Therap.*, **105**, 46 (1952).]

Chronic administration of diphenylhydantoin raised the EST of rats 15 per cent.; single doses were ineffective. Phenobarbital (chronic) raised the EST 28 per cent. Desoxycorticosterone acetate (DCA) had a slight effect alone, and given with either of the above two drugs markedly increased their effect on EST. Trimethadione alone had no effect but slightly increased the effect of DCA. Changes in H₂O, Na, K, and Cl in various tissues produced by the above treatments were determined. No significant influence on brain electrolytes was noted and in other tissues the effects were slight.

L. E. GILSON (Chem. Abstr.).

Effect of Adrenaline, Glucose, and Certain Steroids on Fatal Convulsive Seizures in Mice. Vicari, E. M., et al. [*Proc. Soc. Exptl. Biol. Med.*, **80**, 47 (1952).]

In a susceptible strain of inbred DBA mice the occurrence of fatal audiogenic seizures was significantly decreased by administration of adrenaline, glucose, cortin, cortisone, testosterone, estradiol, and pregnenolone. The last three compounds were the most effective, especially testosterone.

L. E. GILSON (Chem. Abstr.).

Gemonal, A New Drug for Convulsive and Related Disorders. Perlstein, A. M. [*Pediatrics*, **5**, 448 (1950).]

In animal experiments gemonal 50 mgm./kgm. given orally is protective against fatal doses of metrazole without the sedation that is typical with phenobarbital. Lethal dose of gemonal in mice and cats was 250 mgm./kgm. body weight. The human dose recommended was 1.5-2 times that of phenobarbital.

STEVEN CARSON (Chem. Abstr.).

Effect of Glutamic Acid on Mental Function: Pilot Study. Kerr, W. J., Jr., et al. [*Pediatrics*, **5**, 645-8 (1950).]

Large doses of L-glutamic acid given to normal children produced no significant increase in testable intelligence compared to those receiving a placebo. Results did not substantiate previous reports of increased measurable intelligence. The IQ point gain of both were in the standardized test-retest gain values. Attitudinal effects were minimized by carefully controlled procedures described.

STEVEN CARSON (Chem. Abstr.).

Benzedrine and Dexedrine in the Treatment of Children's Behavior Disorders. Bradley, C. [*Pediatrics*, **5**, 24-38 (1950).]

The effect of benzedrine (I) (dl-amphetamine sulfate) and dexedrine (II) (d-amphetamine sulfate) upon the behavior of maladjusted children was studied in a controlled children's psychiatric hospital. Maladjusted behavior of restlessness, nervousness, hyperactivity and distractibility became subdued with (I) and (II) treatment and more successful participation in children's activities was seen. Side effects noted with this therapy were depressant effects upon appetite, frequent production of insomnia, and a markedly less pressor effect which may usually be disregarded. Oral doses of 20 mgm. for (I) and 10 mgm.

for (II) were found to be optimal in studies of 7-day duration and longer periods. Cases treated were of 4 different diagnostic groups; behavior disorders of psychogenic origin (I) improved 70.3 per cent. and (I) and (II) were equally effective. In behavior problems associated with convulsive disorders (I)-treated cases showed 76.9 per cent. improvement and (II)-treated cases showed 45.4 per cent. improvement with (I) being the drug of choice. In psychopathic personalities (I)-treated patients showed 84 per cent. improvement with both (I) and (II) being equally effective. In children with schizoid personalities 63 per cent. showed improvement with (I) and 50 per cent. showed it with (II), there being little choice between the two. (I)-treated children showed no developing tolerance to the drug, with no habituation to (I) seen in children after 12 years of use. Peripheral vasoconstriction was seen quite often for 3-4 hours after treatment. One-third showed best response to (I), the same number to (II), and the same number showed equal response to both, whether favorable or unfavorable. The behavior responses after (I) and (II) therapy are discussed.

STEVEN CARSON (Chem. Abstr.).

Modification in Responses to Sodium of Nerve Fibers Treated with Drugs. Crescitelli, Frederick, et al. [Am. J. Physiol., **169**, 638-48 (1952).]

Experiments showed a significant interaction between certain nerve-blocking drugs and the concentration of Na ions in the external solution. The differential action on the different fiber types of drugs, like amyl carbamate and cocaine, is explained in terms of an interference with a Na mechanism in nerve fibers which have different Na requirements for conduction.

E. D. WALTER (Chem. Abstr.).

The Central Depressant Properties of o-Toloxypropyl Carbamates. Berger, F. M. [J. Pharmacol. Exptl. Therap., **104**, 468-73 (1952).]

The paralyzing activity, toxicity, and anticonvulsant action of mephenesin and several closely related o-toloxypropyl derivatives and their carbamate esters were studied. The carbamates of 3-(o-toloxyl)-1, 2-propanediol and 1-(o-toloxyl)-2-propanol had weaker activities than the parent compounds. The carbamate of 3-(o-toloxyl)-1-isopropoxy-2-propanol had a weaker paralyzing action than the parent compound. None of the compounds produced paralysis of significantly longer duration than did mephenesin. The acute toxicity of all the carbamate derivatives was lower than that of the parent compounds. The anticonvulsant activity of the carbamates was greater in intensity but of equally short duration as the parent compounds.

L. E. GILSON (Chem. Abstr.).

Treatment of Paralysis Agitans with New Preparations. Winther, K. [Ugeskrift Laeger, **112**, 745-8 (1950).]

The preparations used for treatment of Parkinsonism were parpanit, diparcol, and phenergan. Parpanit had a better effect on tremor but a lesser effect on rigidity than the other drugs, but its side-effects were more pronounced.

B. A. (Chem. Abstr.).

Side Reactions of Narcotics and Hypnotics. Hofmann, Heinrich, and Held, Ursula. [Pharmazie, **6**, 646-52 (1951).]

A review with 230 references.

EDWARD H. SHEERS (Chem. Abstr.).

Some Aspects of the Human Pharmacology of Tetraethylthiuramdisulfide (Antabuse)-alcohol Reactions. Hine, Charles H., et al. [J. Clin. Invest., **31**, 317-25 (1952).]

A study was made of 51 problem drinkers following a test drink of alcohol prior to and after antabuse therapy. Antabuse did not alter normal blood-alcohol levels. It did not appear to affect either the rate of absorption or the metabolism of alcohol. It increased the normal resting-blood acetaldehyde level. There was a significant increase in acetaldehyde in the antabuse-treated subject as compared to untreated patients after ingestion of alcohol. Acetaldehyde may be the toxic agent responsible for the most serious consequences of the alcohol-antabuse reaction. Because of the often dangerous cardiovascular effects of antabuse it should be used cautiously.

JOHN T. MYERS (Chem. Abstr.).

Variations in the Pyruvic Acid and Acetaldehyde Contents of the Blood under the Influence of Alcohol. Lecoq, Raoul. [Compt. Rend. Soc. Biol., **145**, 1603-6 (1951).]

Administration of EtOH to rabbits pretreated with tetraethylthiuram disulfide (TTD) caused a small increase in blood AcH and a large increase in pyruvic acid (maximum value observed was 27 mgm./l.). Blood from 10 normal human subjects given neither EtOH nor TTD contained 0.3-3.5, av. 1.6 mgm./l., of AcH and 3.0-6.2, av. 5.0 mgm./l. of pyruvic acid. Blood from 10 chronic alcoholic patients (not given TTD) contained 1.3-10.1, av. 5.1 mgm./l., of AcH and 5.4-11.6, av. 7.8 mgm./l., of pyruvic acid.

L. E. GILSON (Chem. Abstr.).

Action of Histamine and Synthetic Antihistaminics in the Ethanol-tetraethylthiuram Disulfide Effect. Lecoq, Raoul, et al. [Compt. Rend. Soc. Biol., **145**, 1606-9 (1951).]

As determined by chronaximetric experiments on rats, histamine (I) and acetylcholine decrease, and adrenaline increases, the nervous effects of EtOH. Tetraethylthiuram disulfide (TTD) alone counteracts the nervous effects of adrenaline, has no influence on the effects of acetylcholine, and augments the nervous effects of (I). TTD followed by EtOH very markedly augments the nervous effects of (I); this action is partially suppressed by relatively large doses of the antihistaminic, phenergan.

L. E. GILSON (Chem. Abstr.).

Accumulation of Acetaldehyde in Blood after Administration of Antabuse and Alcohol. Smith, H. W. [Rev. Can. Biol., **9**, 95 (1950).]

AcH accumulates markedly in the blood when alcohol is ingested by persons who have had several doses of antabuse (tetraethylthiuram disulfide). This also occurred in mice, rats, guinea-pigs, cats, and dogs. As the dose of alcohol was increased, the response was intensified up to a limit, which appeared to be caused by gastric retention of a large portion of the very large doses of alcohol. Other considerations of the data indicate that the major factor in determining the intensity of the antabuse-alcohol response is the dose of alcohol.

B. A. (Chem. Abstr.).

The Pharmacological Antagonism of Sodium Succinate and Barbiturates. Mezzich, R. G. [Actas y trabajos Congr. peruano quim., 3° Congr., Lima, Peru (**1**), 394-400 (1949); cf. C. A., **45**, 2099i.]

The pharmacological properties of succinates are discussed. In experiments on 25 rabbits, 1 g. Na succinate/kg. body weight prevented death by nembutal (130-180 mg./kg.) in 9 of 14 cases. Without succinate, all 11 controls succumbed to the same amounts of nembutal. Na succinate has strong analeptic properties which decline after solutions have been allowed to stand for several days.

The Pharmacological Antagonism of Barbiturates and Strychnine. Cornejo, J. C. [Actas y trabajos Congr. peruano quim., 3° Congr., Lima, Peru (**1**), 415 (1949).]

Strychnine is effective against lethal doses of barbiturates, but is ineffective if the dose much exceeds a minimum lethal dose.

W. C. TOBIE (Chem. Abstr.).

Selective Response to Narcotics of Spinal Centres with Different Central Delays. Petersen, I. [Acta Physiol. Scand., **25**, Suppl. 91, 44 pp. (1951).]

When a narcotic (ether, dial, EtOH) is administered to a decerebrate preparation the thresholds for pyramidal activation of different muscle groups increase in the following order: Distal muscles of hind leg, proximal muscles of hind leg, distal muscles of fore limb, proximal muscles of fore limb. This differential action is independent of blood-pressure fall. It was also shown that flexor reflexes evoked by natural stimulation of skin receptors of the fore limbs are more resistant to narcotics than those in the hind limbs, whereas tendon reflexes are equally resistant in both.

S. MORGULIS (Chem. Abstr.).

The Potentiating Effects of Various Drugs upon the Action of Hypnotics and Analgesics. (I), (II). *The Effects upon the Evipan Action.* *The Effects upon the Morphine Action.* Fujimura, H., et al. [Bull. Inst. Chem. Research. Kyoto Univ., **25**, 36-49 (1951).]

The hypnotic action of evipan was increased in duration (and also in intensity) by 63-80 per cent by simultaneous subcutaneous injection of some antihistaminics in mice. 4'-Chlorobenadryl was 10 per cent. more effective than benadryl. Benadryl also increased the activity of barbital. With several local anesthetics except cocaine, their increasing effects were not always parallel to their anesthetic activities. Those having N,N-dimethyl radical seemed more effective than those having N,N-diethyl radical. Evipan was potentiated by aminopyrine and antipyrine, the former being more effective than the latter. NaBr and tridione (3,5,5-trimethyl-2,4-oxazolidinedione) did so by 40 and 70 per cent. respectively. Myanesin and hustosil (1,2-dihydroxy-3-(2-methoxyphenoxy)propane) had similar actions. The analgesic action of morphine was potentiated by benadryl and other antihistaminics, several local anesthetics except percaine and cocaine. Evipan, NaBr, tridione, myanesin, and hustosil did not potentiate morphine even with the addition of benadryl and antipyrine. Tutocaine and aminopyrine had some analgesic actions like morphine. A discussion from the viewpoint of chemical structure was given.

S. KITAOKA (Chem. Abstr.).

The Mechanism of the Action of Analgesics. (I): *The Action of Anesthetics and Analgesics upon the Electrophysiological Phenomenon of the Brain.* Yasuhara, Motohiro. [Bull. Inst. Chem. Research. Kyoto Univ., **28**, 83 (1952).]

A special electric response in the brain cortex is caused by stimulation of the sciatic nerve. This may be related to the sense of pain. The electric response was determined using a cathode-ray oscillograph and cathode-ray-coupled amplifier and an AgCl electrode

placed on sensorimotor cortices or the hypothalamus of rabbits and cats. The electroencephalogram always showed a large deviation shortly after stimulation of the sciatic as well as the median nerve. This deviation faded away when animals were anesthetized with anesthetics or hypnotics such as ether, chloral hydrate, urethan, myanesin. Barbiturate derivatives such as amytal, dial, luminal, evipan, and pentothal-Na did not exert such action but only facilitated the revelation of this response as well as lessening the other deviation and levelling out the curves. When narcosis by barbiturate was so deep that the base line of the electroencephalogram was quite smooth, a small deviation preceded the large one. Morphine also abolished the large deviation like ether, etc., in cats. These electric responses of the brain were not found in animals which were spinal anesthetized with local anesthetics such as procaine, cocaine, and percamin. Ether, chloral hydrate, myanesin, procaine, cocaine and morphine antagonized the action of barbiturates. Central stimulants such as strychnine, camphor, caffeine as well as pervitine were ineffective in reproducing the large deviation once abolished by ether.

SHOZABURO KITAOKA (Chem. Abstr.).

The Effects of 1-Adrenaline and 1-Noradrenaline upon Cerebral Circulation and Metabolism in Man. King, Benton, D., et al. [*J. Clin. Invest.*, **31**, 273-9 (1952).]

The effects of continuous intravenous infusions of synthetic 1-adrenaline and 1-noradrenaline on arterial blood-pressure and pulse rate, arterial and internal jugular blood gases, and cerebral blood-flow, O consumption and vascular resistance, were studied in man. Adrenaline produced an increase in mean arterial blood-pressure and cerebral blood-flow without a significant change in cerebrovascular resistance, and also an increase in cerebral O consumption. 1-Noradrenaline, a more potent pressor drug, produced a marked increase in cerebrovascular resistance and a decrease in cerebral blood-flow despite a substantial increase in mean arterial blood-pressure. Cerebral O consumption was not significantly altered.

JOHN T. MYERS (Chem. Abstr.).

The Effect of Theophylline with Ethylenediamine (Aminophylline) on Cerebral Hemodynamics in the Presence of Cardiac Failure with and without Cheyne-Stokes Respiration. Moyer, John H., et al. [*J. Clin. Invest.*, **31**, 267-72 (1952).]

Aminophylline (I) increases the cerebrovascular resistance in patients with cardiac failure and decreases the cerebral blood-flow. Although the arterial blood-CO₂ content usually decreases, the changes are not statistically significant. The jugular-CO₂ content either increases or does not change. Therefore the depression of cerebral blood-flow is not a reflection of decreased CO₂ in the brain. It is more likely a direct effect of (I) on the cerebral vessels. Although the arteriovenous-O differences increase as a partial compensation for the decreased blood-flow, compensation is inadequate. Therefore the cerebral O consumption seems to decrease when (I) is given in cardiac failure. There is no difference in the overall cerebral hemodynamic response of patients in cardiac failure which manifest Cheyne-Stokes respiration and those which do not. The arrest of Cheyne-Stokes respiration after (I) is probably due to a stimulating effect on the respiratory centre. This may be a direct effect, or an indirect effect secondary to the depressed cerebral circulation and the resultant rise in medullary tissue CO₂.

JOHN T. MYERS (Chem. Abstr.).

Poisoning by Barbiturates. Success of Conservative Treatment. Locket, S., et al. [*Lancet*, **262**, 580-2 (1952).]

Analyses of 84 cases with 2 deaths. Recovery after 13.3 gm. of sodium iso-amethyl barbiturate is reported.

BARBARA R. MURRAY (Chem. Abstr.).

Effect of Chemical and Electrical Narcosis on Phagocytosis. Sherstneva, O. S. [*Ark. Patol.*, **14**, No. 2, 78-81 (1952).]

Chloral hydrate narcosis in rabbits causes an immediate lowering by 14-15 per cent. of the phagocytic properties of the blood; this disappears with the emergence from narcosis. Electrical narcosis sharply lowers the phagocytic properties as well (as much as 22 per cent.) The chemical action appears to result from narcotic block of the central nervous system.

G. M. KOSOLAPOFF (Chem. Abstr.).